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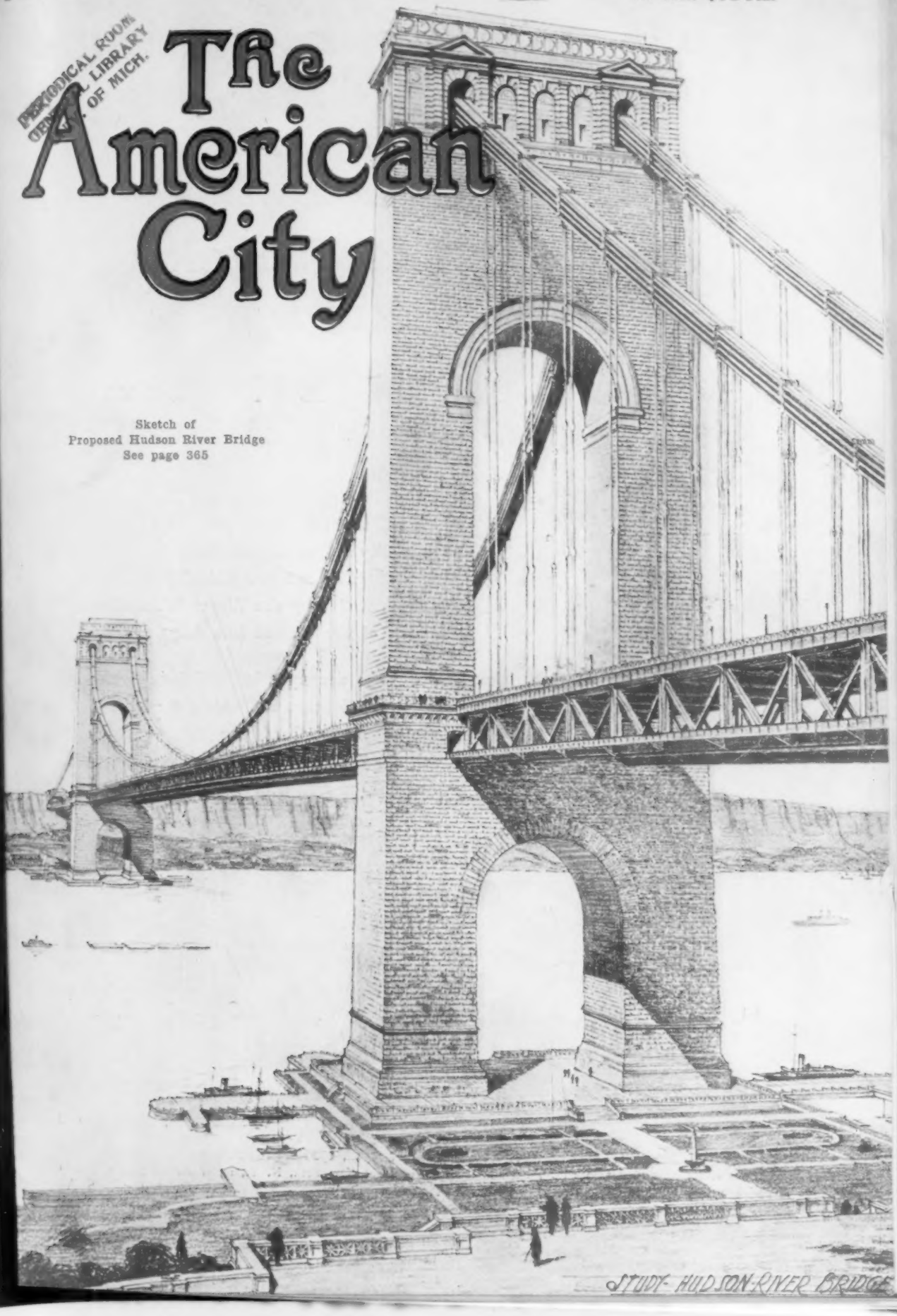

Sketch of
Proposed Hudson River Bridge
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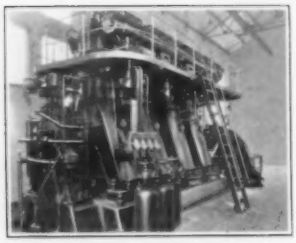
STUDY- HUDSON RIVER BRIDGE

FULTON DIESEL

And The Los Angeles Water Supply



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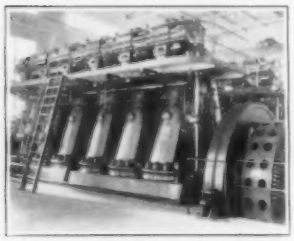

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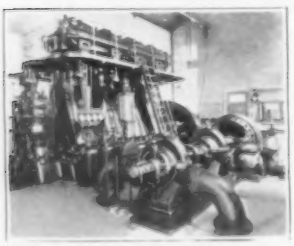

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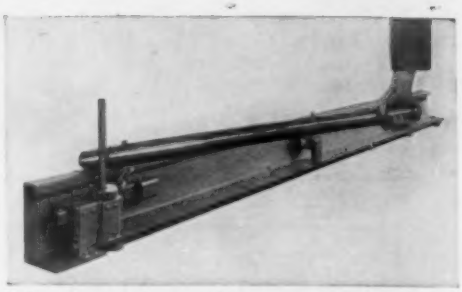

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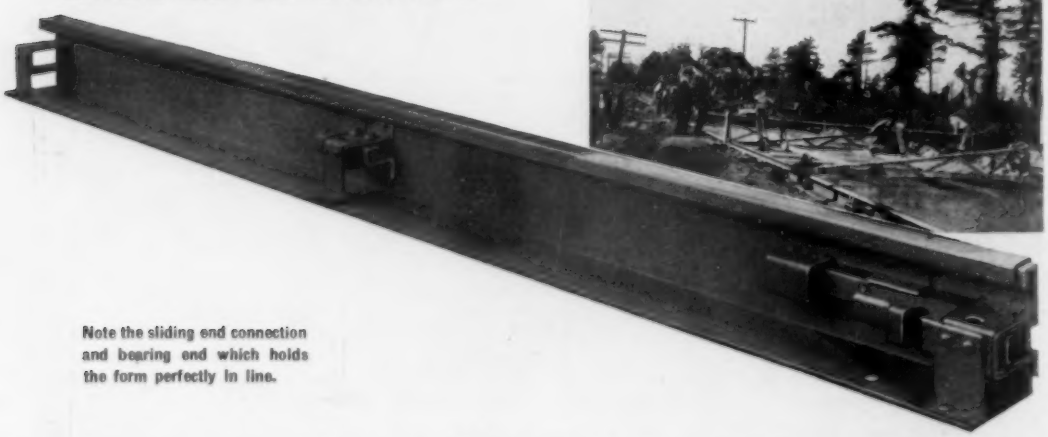

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*A complete line of Truscon Products for better roads built better—Wire Mesh for permanence—Contraction joints for safety—Rib Bars for reinforcing—Curb Bars for curb protection.

Vol. XXXIV
No. 4

The American City Magazine

APRIL
1926

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The Lowest Bidder and the Surety Bond

Does Sound Public Policy Require a Surety Bond on Every Public Works Contract, and Compulsory Letting of the Contract to the Lowest Bidder Who Can Secure Such a Bond?

AT recent conventions of engineers and contractors, and in periodicals devoted to their interests, there has been lively discussion of the problems confronting state and local officials in awarding public works contracts, and of the relationship of surety companies to contractors in the bonding of successful bidders. An important pronouncement on the subject was the accompanying resolution adopted by the Associated General Contractors of America, at its annual convention in Portland, Ore., in January.

Authoritative statements of the point of view of the Joint Conference on Construction Practices ("Establishing the Responsibility of Contractors") and of the Surety Association of America ("What Can Be Done to Improve Contract Bond Conditions?") appear in the *Contractors' & Engineers' Monthly* for March.

Officials responsible for the awarding of contracts for public works are faced with a serious problem when the low bidder is apparently weak financially or is not properly equipped, by reason of lack of plant or experience to handle the work. It cannot be denied that some of these apparently irresponsible bidders do finish the contracts — and finish them in a satisfactory manner. On the other hand, there have been all too many cases where important undertakings have been held up because one link in the project, such as one section of a sewer or of a large water-supply system, has been delayed by the incompetence or financial weakness of some contractor, with resulting inconvenience or financial loss

Resolution on Surety Bonds

Adopted by the Associated General Contractors of America in Convention at Portland, Ore., January, 1926.

WHEREAS, conditions in the surety business pertaining to surety bonds on construction projects have reached the point where the ability to obtain a bond or the actual procurement thereof is not sufficient assurance of the completion of the project by the firm or individual bonded; and

WHEREAS, this condition has been brought about by the frequent bonding by surety companies of irresponsible contractors; and

WHEREAS, failures thus resulting do not tend towards the economical expenditure of either public or private funds for construction; and

WHEREAS, no real effort has been made by the surety companies as a whole to correct the existing conditions which have become intolerable; and

WHEREAS, this condition has been recognized and severely criticized by a Joint Conference on Construction Practices consisting of a committee from:

American Association of State Highway Officials
American Institute of Architects
American Institute of Consulting Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
American Society of Municipal Improvements
Associated General Contractors of America
Highway Industries Exhibitors Association
National Association of Casualty and Surety Agents

now, therefore,

BE IT RESOLVED, That, we, the Associated General Contractors of America in convention assembled, do hereby recommend to owners, either public or private, that, so long as present methods prevail in this branch of the surety business, serious consideration be given to the use of other forms of guarantee for construction projects.

to the public. No penalty charged the contractor, or the surety company which has bonded him, can ordinarily compensate the municipality for a delay of this kind or for slipshod or dishonest work.

We can understand, therefore, the desire sometimes expressed by public officials that laws be amended so as to permit them to select the contractors who will be permitted to bid, so as to have some assurance that the work when awarded will be carried out in accordance with contract provisions. We greatly doubt, however, the wisdom of restricting competition to such a hand-picked list. There are very few public officials—or architects or engineers, for that matter—who would be qualified to pass in advance on the responsibility of each contractor who may wish to bid on any given job. The only safe course under such a system would be to favor the large and wealthy contractors and prevent competition from smaller contractors, regardless of the fact that the smaller contractor might be able to perform in just as satisfactory a way as his bigger rival. Such a policy would put many competent small contractors out of business and would tend to prevent the organization of new contracting firms, and thus eventually give a comparatively few organizations control of the contracting work of each community.

How Shall the Lowest Responsible Bidder Be Selected?

Assuming, therefore, that bidding should be open to all who wish to compete, how shall the lowest responsible bidder be selected? The Joint Conference on Construction Practices has prepared and recommends for the uniform use of public officials, engineers, architects, surety companies, and financial institutions, a set of standard questionnaires on finance, experience, and equipment. The uniform use of these forms* as standards, in the opinion of the Chairman of the Conference's Committee on Uniform Questionnaires, would in no way discourage competition, but would invite greater responsiblity, skill, and integrity into the construction industry, therefore insuring greater economy in performance.

If this questionnaire with its detailed inquiries as to experience, plant, and financial ability, were made part of each bidding form, the filling out of the questionnaire would require an enormous amount of work on the part of honest contractors; and some of the questions would certainly be evaded, or not answered frankly, by the less responsible of the bidders. Much time and annoyance for bidders as well as printing costs for municipalities, could be saved if these questionnaires were merely referred to in the bidding form and the statement were made that the low bidder would be required to fill out the detailed questionnaire before the award of any contract was made to him. We believe this method would also increase competition on small jobs, because many contractors would probably not bid on such work at all if they were compelled to fill out such a voluminous report on the mere chance of their being the low bidder.

If the low bidder, after filling out the prescribed questionnaire, is unable to satisfy the contracting officer that he is capable of handling the work in a satisfactory manner, what is to be done?

In spite of the fact that in some cases the municipality would benefit if a contract could be awarded to the second bidder, there are excellent reasons for the present laws limiting the award to the lowest responsible bidder and requiring the rejection of all bids in case such award is not made. The contracting officer should not be required, however, to consider the bid of any contractor who had defaulted or given unsatisfactory service on previous contracts. But if it is made too easy for public officials to play favorites in the awarding of contracts, there will be inevitable temptations to graft, or unfounded suspicions that graft has played a part in the award when made.

The successful bidder—presumably responsible—having been selected, shall he be required to give a surety bond? There is undoubtedly need for revision of some of our present laws in regard to contract bonding. In the resolution of the Associated General Contractors of America, already quoted, the recommendation is made that, so long as the present methods prevail in this branch of the surety business, serious consideration be given to the use of other forms of guarantee for construction projects.

Optional Form of Contract Suggested

Believing that in many cases a comparatively small amount of real cash would be a better safeguard for the municipality than a surety bond, THE AMERICAN CITY suggests a form of contract which would permit the waiving by the municipality of the bonding requirement, if the contractor on his part will make a cash deposit and will agree, in lieu of a bond, to the retention of, say, 20 per cent

* Published in full in the *Contractors' & Engineers' Monthly* for October and November, 1925.

from each monthly payment, until the total reserve equals 10 per cent of the total contract price. As a concrete example, suppose a municipality wishes to let a contract totaling $100,000. On such a contract the successful responsible bidder, if he does not wish to take out a surety bond, might be required to make a cash deposit of 2 per cent of the contract price on the signing of the contract. This $2,000 would be retained by the municipality, plus a cash reserve of 20 per cent on monthly payments as made, until such time as the total reserve had reached $10,000 (or 10 per cent of the contract price.) After that, no further reserve would be required; and the entire reserve would, of course, be paid to the contractor on satisfactory completion of the work.*

As an additional safeguard for the municipality, the proposed contract form might also provide that the 20 per cent reserve would be continued from month to month for the full life of the contract, unless the contractor could give to the municipality satisfactory evidence that all labor employed was being paid in full and that all material included in previous monthly payments to him had actually been paid for by the contractor.

Just as soon as there is some optional method, such as this, whereby the contractor can avoid paying for a bond, the surety companies will probably take a very different attitude toward the regulations and charges for bonds. In their present position they have the contractor at their mercy. It is practically impossible for him to get his bond outside of the bigger surety companies which, through their rating bureau, maintain a uniform rate. The necessity of giving a bond, no matter how strong the contracting company may be, enables the surety companies to collect large premiums on bonds involving little or no risk. These premiums are consumed in no small degree by the fact that agents receiving large commissions from the surety companies induce them to write other bonds on which the risk and losses are very great.

The bonding rates, which are now much higher than they were a few years ago, are a direct charge on the municipality, as contractors add the cost of the bond to the estimated cost of the work in making up their bids. The desire of the surety companies to have contractors bond their jobs rather than adopt the proposed optional method would doubtless result in a reduction of bonding rates, and lower rates would of necessity result in more careful selection of risks by the surety companies. Another beneficial result would probably be a reduction of commissions paid to agents by surety companies. These, the *Engineering News Record,* in its issue of February 4, states to be as high as 35 per cent, thus putting the surety agents under constant temptation to connive with irresponsible contractors in getting bonds.

Rightly used, the surety bond performs a very useful function for the protection of public officials and as an aid to able and honest contractors of limited resources, to whom the deducting of a safe cash reserve would be a serious handicap in the performance of their obligations. Cannot the public service of the surety business be preserved, and many of its shortcomings be obviated, by some such plan as here suggested?

* Since the foregoing was written, there has been submitted (March, 1926) to Governor Smith of New York by Sullivan W. Jones, State Architect, an important report which advocates radical changes in methods of awarding state contracts for construction work. Mr. Jones recommends that the public building law be amended to eliminate the requirement that a contractor furnish a bond. He also suggests that the form of contract used by the State Architect be changed to provide for progresively diminishing retained percentages on payments made as the work advances and the state's exposure to loss diminishes, beginning with a retention of 20 per cent on the first payment and decreasing proportionately as the work progresses, to 5 per cent on the last payment previous to the final payment which signifies acceptance of the work.

We believe that, whether the scale of retained percentages suggested by THE AMERICAN CITY or the slightly different scale suggested by Mr. Jones were adopted, the added safeguard of an initial cash deposit should be required even though such deposit were only 2 per cent of the total contract price, as above suggested. With such a cash deposit, the municipality would have some hold on the contractor until the retained percentages on payments during the progress of the work equaled a fund sufficient to insure the proper performance of the contract.

HOW NEW YORK STATE REDUCED TRAFFIC FATALITIES IN 1925

Reduction of motor fatalities in New York State by 10 per cent in 1925 is accounted for by the National Automobile Chamber of Commerce as follows:

1. **Strong state law, including revocation of licenses of carelesss drivers.**
2. **Efficient enforecement of law.**
3. **Cooperation of cities with state authorities.**
4. **Vigorous policing of state highways.**
5. **Engineering progress in road construction and street traffic control.**
6. **Newspaper aid in publishing lists of license revocations.**

CITIES HAVING OVER 30,000 POPULATION

248 MUNICIPALITIES. Fiscal Year 1924

PAY TO THE ORDER OF City + District Improvements Expenditures

More than Two Billion Six hundred - Forty one Million DOLLARS

$2,641,797,778 From Taxes, Assessments, Bond Issues +c

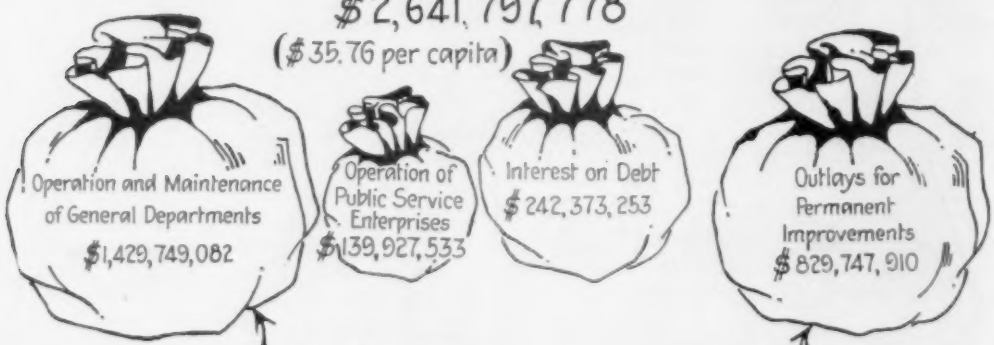
New Financial Statistics of Cities

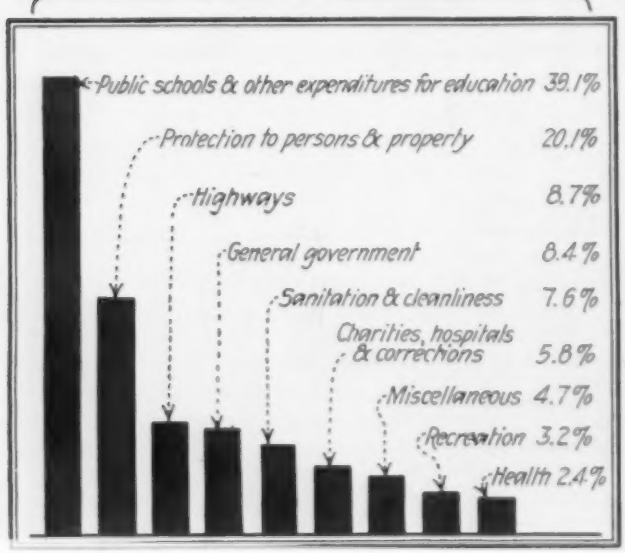
THE Department of Commerce announced on March 10, 1926, a summary, compiled by the Bureau of the Census, of the financial transactions of the 248 cities having a population of over 30,000 for the fiscal year 1924. These statistics cover the government of the city corporation proper, and also independent school districts, sanitary districts, park districts, and other independent districts practically coextensive with the cities. They also include a per cent of the financial transactions of the county government for cities having over 30,000 population. In order that the statistics for such cities may be comparable with those for other cities in this class in which the ordinary county functions are performed by the city government. The accompanying graphs have been prepared by The American City from the Census Bureau figures.

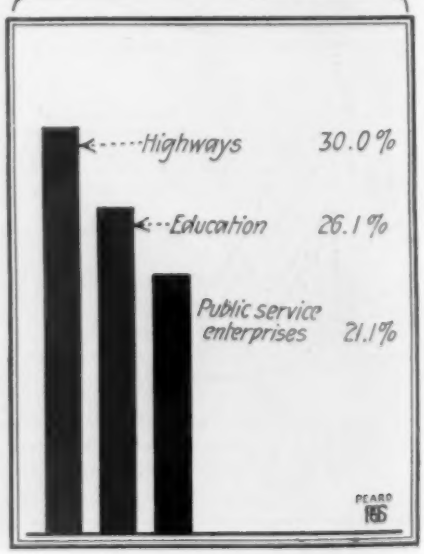
One Year's Expenditures of 248 Cities

$2,641,797,778

($35.76 per capita)







Recent Developments in Concrete Paving Practice

By H. E. Surman

Engineer of Design, Department of Public Works and Buildings, Division of Highways, Springfield, Ill.

ONE of the most important developments in concrete paving practice is the improvement in highway alignment. While a few years ago most of the states were satisfied to adhere quite closely to existing highways, relocations have become the order of the day, and we no longer hesitate to open up entirely new rights of way for the purpose of saving distance between important centers, cutting down construction, operating, and maintenance costs, and avoiding grade crossings with railroads. Where a few years ago right-angled turns were rounded by means of a 100- or 200-foot radius curve, and practically no superelevation was used, to-day the modern highway is built with a minimum 500-foot radius curve for right-angled turns with correspondingly longer curves for smaller angles, and adequate superelevation provided for all curves up to 5,000- or 6,000-foot radius. The essential thing is to provide an alignment that will permit traffic to move at the legal speed limit with reasonable safety.

A Continued Demand for Good Roads

The highway rolling-stock of the United States has increased to such enormous proportions that it is certain the owners of this stock will continue to demand the construction of highways at a rapid pace for some years to come. It is therefore the engineer's duty to be continually on the alert to evolve new and better methods that will lead to better highways. The people are demanding more and more that the modern highway be safe, smooth, and well marked. They are not interested so much in the engineering details of this accomplishment as they are in the results obtained.

Wider Earth Shoulders

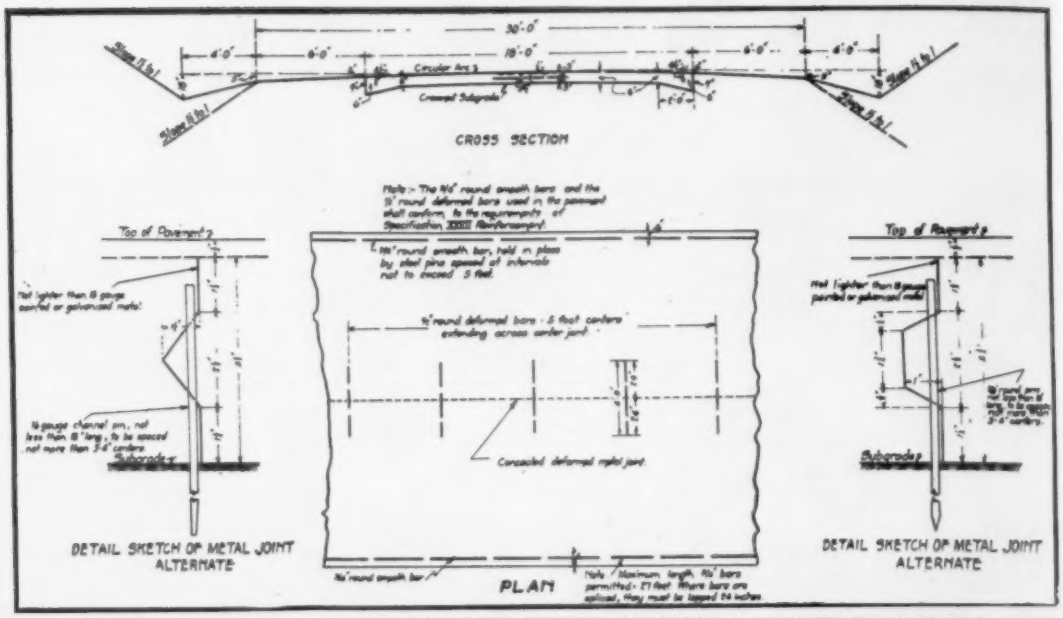
Earth shoulders are now built of sufficient width to permit a vehicle to park along the side of the pavement without interfering in any way with traffic. This is a very essential feature of road design and construction and is not considered seriously enough by many of the states. The minimum shoulder width for country districts should be 6 feet, and near large centers of population it should be 8 feet.

Shallower Side Ditches

The development of the shallow side ditch, wherever practical, is an important safety feature. The practice in Illinois is to construct a 4 to 1 slope from the edge of the shoulder to the bottom of the ditch, with the ditch only 12 inches below the shoulder elevation. This practice could not, of course, be carried out in cases where deep ditches are required for larger quantities of water. This might also prove detrimental in some of the northern states because of the snow-removal problem, but wherever it can be applied without detriment to the drainage of the road, it will certainly help promote the safety of the highway.

Stronger Cross-Section

One of the most outstanding and far-reaching developments in concrete paving design is the standard cross-section developed from the Bates road tests, conducted by the Illinois Highway Department during the years 1920 to 1923, inclusive. The main features of this design are the thickened edge with longitudinal steel bars near each outer edge, and a longitudinal dividing plane in the center of the pavement with transverse dowel bars. More than thirty of the states are now using this design or some modification of it. A more recent development of the design is the application of a heavier or thicker pavement near large centers of population. The Illinois practice is to use a 6-inch central thickness with a 9-inch edge thickness for traffic near small cities and rural districts, and a 7-inch central thickness and a corresponding increase in edge design for traffic near large centers of population. Pavements near the larger centers also are built to a width of 20 feet for the initial construction unit, whereas the down-state pavements for the more



CROSS-SECTION AND PLAN OF 18-FOOT PORTLAND CEMENT CONCRETE PAVEMENT WITH METAL JOINT

rural districts are mainly 18 feet in width. The edge design for the 7-inch center thickness pavement is computed to give a corresponding increase in strength as compared to the edge design used with the 6-inch center thickness pavement. This heavier type of design is not used for the purpose of permitting heavier loads to travel the highway, but as a safety guard for the fatigue in the concrete due to a greater frequency of maximum loads. Approximately 3,000 miles of concrete pavements have been built in Illinois on the basis of the thickened edge and longitudinal center joint design.

Eight-Lane Roads

One of the most recent developments in highway design is the so-called super-highway where eight or more traffic lanes are provided for on the same right of way. This would seem to be the proper solution of the congestion problem in cases where parallel routes designed to relieve such congestion are already improved. To make the plan successful, however, it is necessary that adequate provision be made to take care of traffic all the way to the heart of the metropolitan area which produces the major portion of the traffic, and unless this is done, the object of the super-highway will be defeated.

Improving Existing Pavements

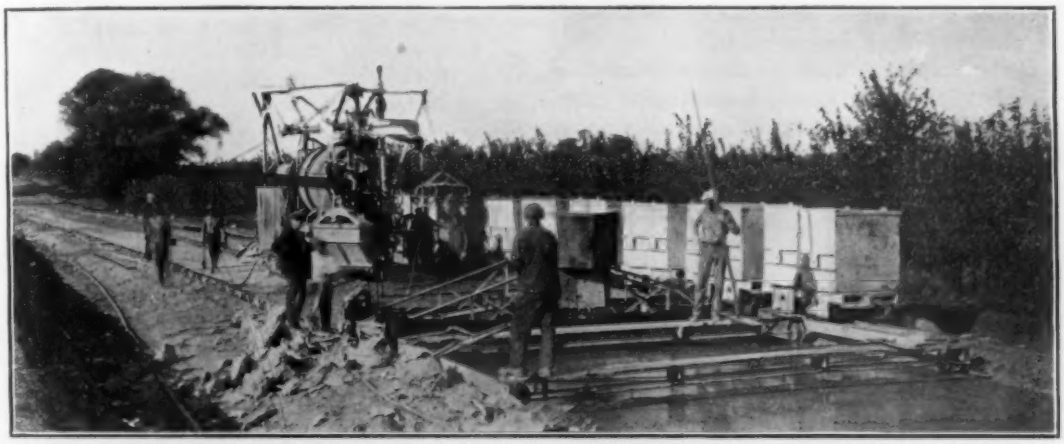
Another important development which is just in its infancy is the matter of widening and strengthening existing pavements. This is the natural outgrowth of traffic increases on the more important routes, and the years to come undoubtedly will witness the widening of many miles of pavement that are no longer of adequate width to care for the traffic which comes upon them.

Smoother Pavements

The public is continually demanding smoother pavements, and too much emphasis cannot be placed on this important feature of concrete paving practice, because the quality of the pavement is often judged by the smoothness of its surface. The methods described in specifications for obtaining smoothness vary considerably among the different states. In Illinois very good results have been obtained by the use of the compacting or finishing machine, belts, 10-foot straight-edge, and long-handled float. The use of the long-handled float and 10-foot straight-edge to remove the surplus water and laitance from the surface of the pavement have been largely instrumental in eliminating the scaling action that was so common in concrete road construction up to a year ago. Diligent application of the above-mentioned mechanical equipment and tools has eliminated almost entirely the scaling action on the surface of concrete pavements placed in Illinois during the past year. The surface is checked for smoothness with a 10-foot straight-edge both before and after the concrete takes its initial

set, and all variations exceeding ¼-inch are at once eliminated.

A very good method for testing smoothness after the concrete has attained its initial set is by means of a machine known as the profilometer. This is a simple machine constructed preferably of a number of rubber-tired bicycle wheels with a device for recording the contour of the pavement as the machine moves over the surface. A number of different profilometers have been constructed by the Illinois Highway Department, and tests were made of the various machines to determine their efficiency. Profilometers having 32, 16, and 8 wheels, respectively, were constructed, and assuming the 32-wheel machine to be 100 per cent efficient, it was found that the 16-wheel machine had an efficiency of 99.5 per cent, and the 8-wheel machine, an efficiency of 97 per cent; or, in other words, the 8-wheel machine recorded 97 per cent of the high or low spots that were recorded by the 32-wheel machine. It appears, therefore, that the 8-wheel machine is accurate enough for all practical purposes, and has the advantage of being easier to handle in the field. The profilometer, besides being a good detector of rough spots in the pavement, is a valuable machine in that it furnishes an accurate graph of the surface of the pavement which can be used in future investigational work.



CONSTRUCTION OF ILLINOIS BOND ISSUE ROUTE 22 NEAR AURORA, SHOWING FINISHING EQUIPMENT

Checking Specified Thickness

The question of obtaining the specified thickness for the concrete pavement is one of prime importance, but it is only very recently that engineers have taken the proper precautions to insure that the thickness specified is actually obtained in the finished work. The strength of the pavement slab varies as the square of the thickness, and if the pavement is constructed only 5 inches thick where 6 inches is specified, the resultant pavement is only about five-sevenths as strong as the design called for. In order to insure obtaining the thickness specified, the practice in Illinois is to require the use of a heavy subgrade templet which is mounted on rollers and placed on the side forms between the mixer and the concrete. Thus the subgrade is checked after the mixer has traveled over it and immediately before the concrete is placed. In addition to this, the resident engineer is required to take not less than three cross-sectional readings on the subgrade each day, and again on the finished pavement just after it has taken the final set. A final check consists in drilling cores and determining the actual thickness. Every effort is made to help the contractor to secure the minimum thickness specified as the work progresses, and it might be stated that since this method has been in practice there have been exceptionally few cases of shortage in thickness.

Quantity and Quality of Concrete

Important considerations involving the quantity and quality of the resulting concrete are: checking daily the amount of cement used and the number of batches of concrete required per unit of length; study of yield of concrete by suitable field determinations; automatic methods of measurement to secure uniformity of batches; automatic locking and timing devices to secure uniform mix; automatic water control to secure uniform consistency; and standardization of mixers.

ILLINOIS BOND ISSUE ROUTE 20 NEAR WOODSTOCK, SHOWING SHOULDERS BUILT OF SUFFICIENT WIDTH TO PERMIT PARKING WITHOUT INTERFERING WITH TRAFFIC

Curing Agent Saves Labor

Another important development is the use of calcium chloride as a curing agent. This probably has been used in Illinois more than in any other state, not less than 2,000 miles of concrete paving having been cured by this method. Calcium chloride is applied in flaked or granulated form and spread uniformly over the surface of the pavement by squeegee or suitable mechanical device at a rate of about 2½ pounds per square yard of pavement. The main advantages over other curing agents are the saving of labor and the fact that concrete so cured attains a greater strength in its early stages.

Use of Aluminate Cement

The use of aluminate cement for paving short gaps, and particularly for patches in maintenance work, is becoming more popular. This enables the pavement to be opened within 24 hours after the concrete is placed, and, while the cost in small quantities is about four times that of portland cement, it is justified by the convenience of reduced detours.

Traffic Center Lines

One of the most important recent developments and one which adds greatly to the safety of the highway is the use of the traffic line. This was the outgrowth of the longitudinal center joint design for concrete pavements, although it is now used with equal success on other types of pavements. The center traffic line is now in use by most of the states and, in the writer's opinion, has done more to avoid accidents on highways than any other one factor.

Responsibility of Contractor

What might be mentioned as essential in concrete paving practice is the care being taken by the states to analyze the contractor's ability both financially and as to performance of work before awarding a contract. This involves the study of financial statements, the past performance of the contractor, the equipment for the performance of the work, and the contractor's detailed plan and schedule.

Strength Tests of Concrete

During the past two years the transverse test for determining the strength of concrete has gained favor rapidly. This gives less variation in results than compressive tests on cores drilled from concrete pavements and has the added advantage of more nearly resembling the stress in concrete under actual traffic. Tests were made on 200 test beams, each 6x8x30 inches, enough concrete being made in one batch to cast two beams at one time. Both transverse and compressive tests were made on each specimen. By means of the cantilever testing apparatus, two transverse tests were made on each beam. From each of the three remaining sections of each broken specimen, cores were drilled by a calyx drill, so that by this method two flexural and three compressive stresses were recorded for each specimen. Tests were made at 14-, 28,- and 90-day ages. The results show that the average difference in the compressive tests amounted to 72 per cent, while the average difference in the transverse tests was only 3.7 per cent.

ACKNOWLEDGMENT.—From a paper read before the American Road Builders' Association, at Chicago, 1926.

A Street-Lighting Committee Reports

Committee of American Society for Municipal Improvements Gives Data for 1925

DURING 1925 many improved street-lighting systems of magnitude were completed or planned. Brief descriptions of several noteworthy installations are given below:

Washington, D. C.

Under the direction of the Engineer Commissioner, a Committee on the Lighting Needs of Washington was appointed, consisting of city engineers, architects, and illuminating engineers. After an extensive study a report was submitted, classifying all streets according to the lighting requirements and recommending the desirable illumination for each class. Designs of lighting units and standards were also prepared and accepted which provide a complete and harmonious street-lighting plan for the entire city.

Indianapolis, Ind.

The Board of Public Works has authorized a complete new street-lighting system for the city, based upon a classification of the various streets according to the lighting requirements. Work is now going forward on this system.

The down-town business section is to be provided with two-light ornamental posts spaced opposite each other on 100-foot centers, using two 15 000-lumen Mazda C lamps per post at a mounting height of 20 feet. The secondary business streets are to have single-light ornamental standards using 15,000-lumen Mazda C lamps located opposite each other on 100-foot centers. Primary thoroughfares are to be illuminated by means of single-light ornamental posts using 15,000-lumen Mazda C lamps, spaced from 100 to 120 feet apart in a staggered formation. Secondary thoroughfares are to be lighted by means of single-light ornamental posts using 6,000-lumen Mazda C lamps staggered 100 to 125 feet apart, while the residential streets are to have 10,000- or 6,000-lumen Mazda C lamps in pendent units according to the character of the street.

DAY VIEW OF BROAD STREET, AUGUSTA, GA.

Augusta, Ga.

Broad Street, in Augusta, Ga., is said to possess the best lighting system in the Southeast. The installation consists of two-light ornamental standards using two 15,000-lumen Mazda C lamps per standard. The light sources are located 20 feet above the street surface and spaced opposite each other on 110- to 130-foot centers.

Chicago, Ill.

The city of Chicago has begun a program of modernizing the residential street lighting that has already required about 15,000 units. Lamps of 2,500 lumens in size, equipped with rippled alabaster globes are used. Concrete standards placed in a staggered formation with one unit for every 150 feet of street will support the lamps at a height of about 12 feet.

Street-Lighting Practice

As emphasized by the foregoing installations, in planning the new street-lighting system it is of the utmost importance to develop a comprehensive lighting plan for the entire city, zoning the streets into their proper classifications. This does not mean, necessarily, that the city should have at once a complete new system. It does insure, however, that as future extensions and revisions are made they will form a part of a completely unified design. The family of lighting equipment, in which globes and posts of the same design but of different sizes, mounting heights, and lamps are utilized for the various classes of streets, offers a happy solution to the haphazard arrangement of different equipments now all too prevalent in most cities.

Table I indicates recommended practice for street lighting in which the streets of typical cities have been classified according to the lighting requirements. The following discussion outlines these requirements in brief.

Principal Business Districts

Illumination in which one may wait in safety zones for street cars or cross street intersections with confidence, in which passing acquaintances may be easily recognized—in fact, the same degree of safety, comfort and convenience at night as in the day seems to be the ultimate goal of business district lighting. In the larger cities this calls for a minimum of one 25,000-lumen or two 15,000-lumen lamps per post with units located opposite each other on approximately 100-to-150-foot centers. Desirable mounting heights range from 18 to 25 feet. Esthetic considerations demand a pleasing and dignified appearance of lighting equipment, so designed as to allow a sufficient amount of upward light to adequately illuminate the façades and upper cornices of the buildings.

Secondary Business Districts

In the secondary business district the traffic congestion is not so great; the streets in general are narrower, and the buildings lower. The illumination requirements are therefore not as severe as in the principal business dis-

STREET-LIGHTING PRACTICE

Population of City	Classification of Street	Lumens* Per Post	Mounting Height Feet	Lamp Spacing Feet	Lumens Per Foot of Street Minimum	Lumens Per Foot of Street Desirable	Arrangement of Lamps on Street
100,000 or Larger	Principal business	15000–50000	18–25	100–150	400	400–1000	Opposite
	Secondary business	10000–25000	15–18	80–125	200	200–500	Opposite
	Principal thoroughfares	10000–15000	15–20	100–150	70	70–200	Opp. or Stag
	Boulevards and parks	4000–10000	15–20	100–150	30	30–100	Opp. or O. S.
	Secondary thoroughfares, wholesale and mfg. district	4000–10000	15–20	100–150	30	30–70	Staggered
	Residential	2500–4000	13–20	125–200	15	15–30	Staggered
	Alleys in business section	2500–4000	16–20	125–200	15	15–30	One Side
	Outlying streets and alleys	1000–2500	16–20	200–300	3	3–8	One Side
30,000 to 100,000	Principal business	10000–30000	15–20	80–125	300	300–500	Opposite
	Secondary business	10000–15000	15–18	80–125	200	200–300	Opposite
	Principal thoroughfares	6000–15000	15–20	100–150	40	40–150	Staggered
	Boulevards and parks	4000–10000	15–20	100–150	30	30–100	Opp. or O. S.
	Secondary thoroughfares	4000–10000	15–20	100–150	30	30–70	Staggered
	Residential	2500–4000	13–20	125–200	15	15–30	Staggered
	Outlying streets and alleys	1000–2500	16–20	200–300	3	3–8	One Side
5,000 to 30,000	Business	6000–15000	14–18	80–125	120	120–300	Opposite
	Principal thoroughfares	4000–10000	15–20	100–200	30	30–100	Staggered
	Secondary thoroughfares	4000–6000	15–20	100–200	20	20–60	Staggered
	Residential	2500–4000	13–20	150–250	10	10–20	Stag. or O. S.
	Outlying streets and alleys	1000–2500	16–20	200–300	3	3–8	One Side
5,000 or Less	Business	4000–10000	15–16	80–110	80	80–200	Opposite
	Thoroughfares	2500–6000	15–20	100–200	20	20–60	Stag. or O. S.
	Residential	2500–4000	13–20	150–300	8	8–15	Stag. or O. S.
	Outlying streets and alleys	1000–2500	16–20	200–300	3	3–8	One Side
Highways	Light pavement	2500–4000	25–35	300–400	6	6–12	One Side
	Dark pavement and dirt roads	2500–4000	25–35	200–300	8	8–20	One Side

* The nominal horizontal candle-power is one-tenth the lumen rating.

DOWN-TOWN INDIANAPOLIS AT NIGHT

tricts; 10,000-lumen lamps opposite each other every 100 feet, with a mounting height of 15 to 18 feet, should be considered a minimum in the larger cities.

Principal Thoroughfares

The thoroughfares or arterial feeder streets leading out from the business section have developed severe requirements for lighting under the present conditions of transportation. These streets carry automobiles driven at high speed by those who are often unfamiliar with the street. It follows, therefore, that it is on these streets that the large proportion of night traffic accidents occur. Present practice includes lighting these streets with the same type of system as recommended for secondary business districts. Principles of economy, however, generally dictate a somewhat lower expenditure. Satisfactory results will be obtained, unless the street is very wide, by omitting every other lamp, leaving a staggered arrangement of unit. The bracket type standard has the virtue of bringing the lamp out over the street surface, thereby reducing foliage interference. Bringing the lamp over the pavement also increases the possibilities of seeing objects by silhouette against the bright spots of light beneath the lamp, or against the glint reflections or sheen from the pavement surface; also, both curbs are more distinctly revealed. The absence of lighted building fronts, which in the business districts reduces contrast and therefore glare, makes it desirable on thoroughfares to mount the units somewhat higher than is ordinarily recommended in secondary business district lighting. Where bracket type equipment is used, good practice for streets of ordinary width should be a minimum of one 10,000-lumen lamp for every 150 feet of street, with a mounting height of not less than 20 feet. Refractors, for redirecting the upward rays of light to the street, are recommended.

Boulevards and Parks, Secondary Thoroughfares, Wholesale and Manufacturing Districts

In these classes of streets the lighting requirements are quite similar to those of the primary thoroughfares, although not quite as rigid. The same type of equipment but with a smaller size lamp is recommended. This system meets present requirements satisfactorily and by substituting larger lamps will adequately take care of increased traffic congestion in the future.

Boulevards are, in general, winding drives with an occasional sharp turn, and for this reason a staggered arrangement of lighting units is apt to be confusing to automobile drivers. Where the roadway is narrow, lamps located on one side are satisfactory, but where the pavement is exceptionally wide, the units should be located opposite each other on both sides of the street. In the larger cities, desirable systems for the foregoing classes of streets call for a minimum of one 4,000-lumen lamp every 150 feet, with a mounting height of from 15 to 20 feet.

Residential

Where residence streets carry a large amount of through traffic, they are, in effect, thoroughfares and should be lighted as such. In every city, however, there is a large percentage of street mileage, known as residence territory, which is not used for through travel and is therefore not subject to any material amount of high-speed traffic. While the lighting requirements are not as severe as on the

thoroughfares, a minimum standard of illumination for reasonably satisfactory service should be provided to insure that obstructions and serious breaks or defects in the pavement will be revealed, or that children playing in the street will readily be seen by an automobile driver when going at a fair rate of speed, and that turns, dead ends, and street intersections will be definitely marked. Any inequalities in sidewalks should be rendered visible, dense shadows from trees should be minimized, and street signs and house numbers should be revealed. Enough light should be provided in front lawns and between houses to avoid dark hiding places; care should be exercised, however, that equipment should not appear unduly bright from porches or upper-story windows.

A staggered arrangement of units is desirable in order to alleviate tree-trunk shadows and provide equal illumination on both sidewalks. The bracket unit has the same advantages on residence streets as on thoroughfares and, again, a refractor should be used to obtain more efficient utilization of light on the street. The refractor serves an additional advantage in that it reduces the amount of light on the porches and in the upper windows of the residences.

Foliage often limits the mounting height of the lighting units; however, this height should in no case be less than 13 feet to the light source. Bracket equipments, because they bring the units out and away from the trees, allow mounting heights of from 16 to 20 feet. One 2,500-lumen lamp for every 150 feet of street, or one 4,000-lumen lamp for every 200 feet, should be considered a minimum for an adequate design.

Alleys and Outlying Streets

With the appropriations usually available for street lighting, it is impossible to provide much more than marker lights for alleys and outlying streets.

In business district alleys 2,500-lumen lamps are the smallest that should be provided, while in the outlying sections 1,000-lumen lamps may meet the requirements until the demands become more severe. Pendant refractor fixtures are recommended, except that in the case of 1,000-lumen lamps, radial fluted reflectors are satisfactory.

Larger Lamps Being Used

There is a distinct trend toward the use of larger lamps in street lighting. Special equipment, construction, and maintenance costs are practically constant for all sizes of lamps, and electrical energy and lamp renewals, the outstanding variables, contribute but a minor proportion of the total annual operating cost, especially where underground construction is used. This fact, coupled with the urgent need for better illumination because of traffic congestion and more liberal use of the streets at night, is responsible for the tendency toward elimination of lamps of less than 2,500 lumens. Analysis of costs indicates that it is poor economy for cities to contract for less than 2,500-lumen lamps where underground construction is involved. Where overhead construction is utilized for temporary installations in outlying territories, 1,000-lumen lamps may be used, but certainly nothing smaller.

Asymmetrical Distribution of Light

The idea of asymmetrical distribution for street lighting is not new. Even before the highway units were developed and back to the time the gas-filled lamps were made commercially available, experimental work was done with this type of distribution. At that time, however, most street-lighting equipments were allowed to swing in the wind, and consequently asymmetrical distribution was unsatisfactory. With the trend toward rigidly supported pendant units and ornamental installations extended to the thoroughfares and residence streets, the interest in equipment which confines a greater proportion of the light to the roadway has been revived. It is not felt that asymmetrical distribution of light is applicable to all streets; nevertheless, there are a number of locations where it will work out to advantage and give a more economical utilization of light than a symmetrical distribution. A number of types of refractors are available, some differing quite radically from others in the form of light distribution.

Maintenance

The question of the adequate maintenance of street-lighting units is receiving more attention than it has in the past. Progressive cities are arranging for the establishment of systematic maintenance schedules for the cleaning of glassware from four to twelve times a year, depending on the needs of the particular location.

The units are thoroughly washed with soap and water or some other cleansing compound. Lamps which have lived long beyond their rated life and in which the filament may have sagged or the bulb become blackened, are removed from the circuit.

Outages are costly, since they require a trouble call. In order to eliminate this and also have all the lamps operating at apparent normal candle-power with a consequent improved appearance of the system, some operators are keeping records on each lamp, and after they have burned, say, 1,600 hours, removing them from the circuits. Other operators patrol the system with the purpose of removing all lamps which are apparently low in candle-power. Still others divide the territory in district and as soon as the outages become excessive in any district all lamps are replaced. The removed lamps are then inspected, and those which have blackened bulbs, badly pitted filaments, or other indications that the lamp has lived practically its normal life, are broken.

Modern fixture design is tending toward dust-tight and bug-proof equipment; but even with the best-designed equipment, if good results are desired, a systematic maintenance schedule must be adopted and rigidly adhered to.

The New Proposed Hudson River Bridge

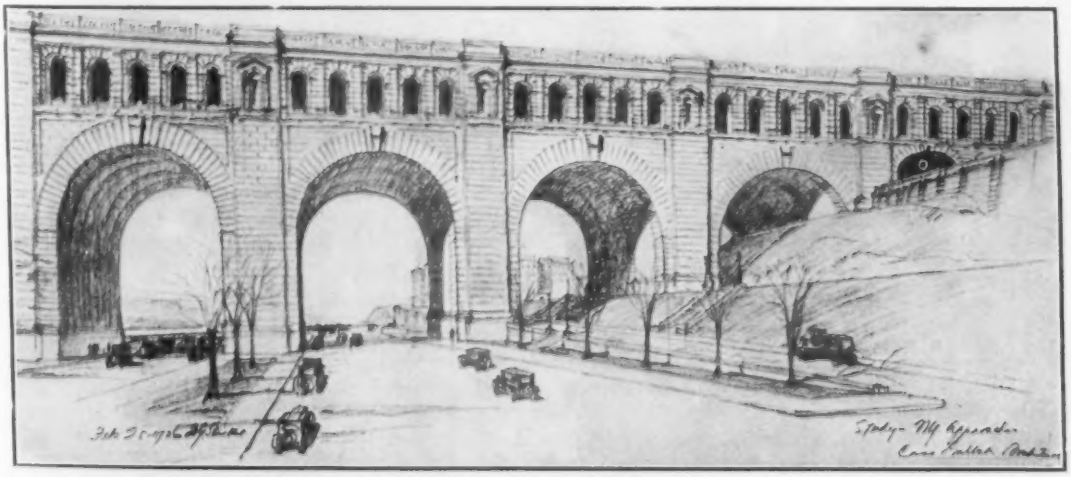
Ultimate Capacity Eight Lines of Vehicular Traffic, Two Lines of Street-Car Traffic, and Two Lines of Bus Traffic

ON Saturday, March 12, 1926, the engineer's report on the proposed Hudson River Bridge to link the Fort Washington Section of New York City with Fort Lee, N. J., was approved at a joint session of the New York and New Jersey Hudson River Bridge Advisory Committee. This great structure, the architect's sketch for which is shown on the front cover of this issue of THE AMERICAN CITY, will have a central span of 3,500 feet between piers, or twice the span of the Philadelphia-Camden bridge, the longest suspension bridge so far built. The rock cliffs of the Palisades form the natural abutment and anchorage on the New Jersey side, and for the sake of symmetry, which is an essential esthetic requirement, the side span on the New York side is made the same, or approximately 700 feet.

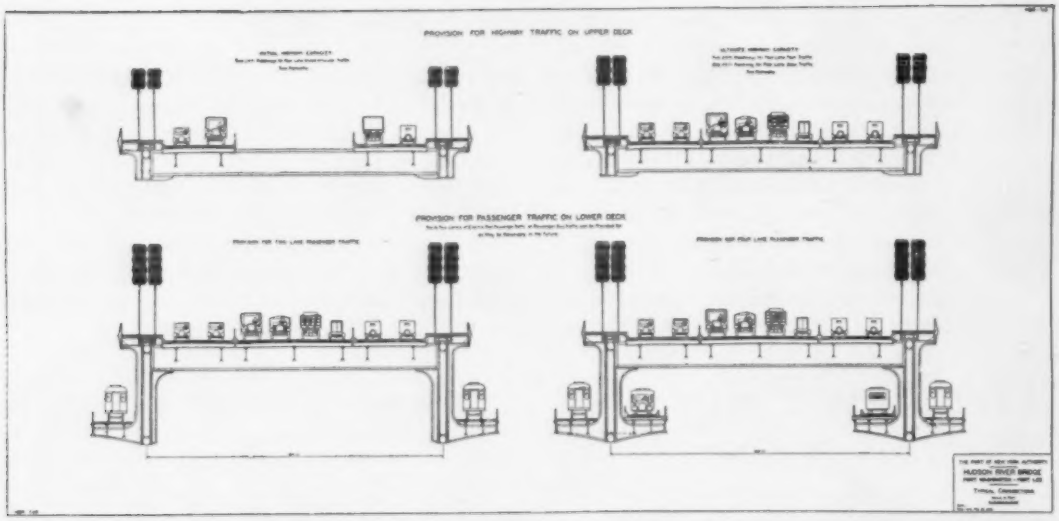
The main elements of the bridge are the 3,500-foot span across the river, the towers rising 650 feet above the mean high-water mark for the support of the cables, the anchorages in which the cable terminals are imbedded, and the approaches. The span across the river will be of the suspension type. The lines of a suspension bridge are in themselves graceful and beautiful, and the enormous scale of the cables and supporting members is such that the span cannot fail to be impressive.

It is proposed that the towers shall be a combination of steel and concrete with granite facing. These piers or towers will measure about 220 feet in the north-and-south dimensions by 75 feet in the east-and-west dimensions, exclusive of the projecting water cable and base, and will rise to a height of 650 feet above the water. When it is realized that the Washington Monument in the National Capital is 55 feet square at the base and rises to a point 555 feet above the ground, the great size and scale of these bridge towers will be more apparent.

The roadway is located about 235 feet above



STUDY OF POSSIBLE NEW YORK CITY APPROACH FOR PROPOSED HUDSON RIVER BRIDGE



TYPICAL PROGRESSIVE CROSS-SECTION OF THE PROPOSED HUDSON RIVER SUSPENSION BRIDGE
Upper left—Initial highway capacity: two 24-foot roadways for four-lane mixed vehicular traffic and two footwalks, estimated to be sufficient for ten years. Upper right—Ultimate highway capacity of upper deck: two 24-foot roadways for four-lane fast traffic and one 40-foot roadway for four-lane slow traffic and two footwalks. Below—Provision for passenger traffic on lower deck. at left—Provision for two-lane passenger traffic and at right for four-lane passenger traffic. Two to four lines of electric rail passenger traffic or passenger bus traffic can be provided for as may be necessary in the future and as indicated in the cross-section.

mean high water, and passes through each of the towers beneath a great arch 95 feet wide and about 230 feet high.

The anchorage on the New Jersey side will penetrate deep into the cliffs. The anchorage on the New York side will be 580 feet east of the center of the easterly tower, and will be about 230 feet in its east-and-west dimensions. From this anchorage, extending to the rising ground east of Riverside Drive will be a series of great arches about 80 feet high by 70 or 80 feet wide.

The approach on the New York side will extend to Fort Washington Avenue, from which roadways or ramps will descend on both sides of the bridge to Riverside Drive. A plaza of considerable size is planned between Fort Washington Avenue and Broadway. Consideration is also being given to making the central portion of the bridge roadway pass below the level of Fort Washington Avenue at about the level of Broadway.

Traffic Capacity of Bridge

One of the most important and complex questions which had to be solved is the determination of the traffic capacity of the bridge as regards both kind and volume of traffic. The question is necessarily closely related to a study of the traffic situation, and definite solution has to await the results of these studies. The legislative acts did not specify the kind of traffic to be accommodated on the bridge, but existing conditions point clearly to the need of a crossing primarily for vehicular traffic. Furthermore, while the development of the territory contiguous to the bridge will sooner or later call for the accommodation of a considerable volume of passenger traffic, it is not likely that rapid transit or other rail passenger traffic facilities will be needed for many years to come.

It is also realized that the demand for passenger traffic in the immediate future, and probably for many years to come, will be filled by passenger busses running over the bridge roadway. Any provision for the accommodation of rail traffic which would involve a comparatively large outlay at present, would therefore not be warranted. As a result of the studies, it now appears quite feasible to build the bridge initially for highway traffic only, but with provision at a small extra expenditure for the future accommodation of rail passenger or bus passenger traffic.

The design as now developed and reproduced with this description is exceptionally far-reaching in its provision for a gradual increase in traffic capacity with a minimum possible initial expenditure and with the least possible time of construction before the bridge can be opened to traffic.

The engineering staff responsible for the tentative report on the proposed bridge consists of O. H. Ammann, Bridge Engineer; W. W. Drinker, Chief Consulting Engineer; Professor William H. Burr, Consulting Engineer on Bridges, and J. E. Ramsey, Chief Executive Officer. Cass Gilbert is the Consulting Architect.

The Trailer System of Garbage Collection in Milwaukee

By J. P. Schwada
City Engineer

THE collection of garbage and other refuse material has always been a problem and will always require the serious attention of officials of the various municipalities. What has proved a solution of the problem in one city may not be a solution elsewhere. The cost of labor, climatic conditions, the location of the disposal plant, the topography, and the size of the municipality are important factors that must be considered in determining the type of the equipment to be used, and since these factors vary, the equipment required to collect garbage will necessarily vary in conformity with the conditions that are to be met.

Since 1923, the city of Milwaukee has gradually perfected the trailer system of collecting its municipal waste, which has proved satisfactory.

History

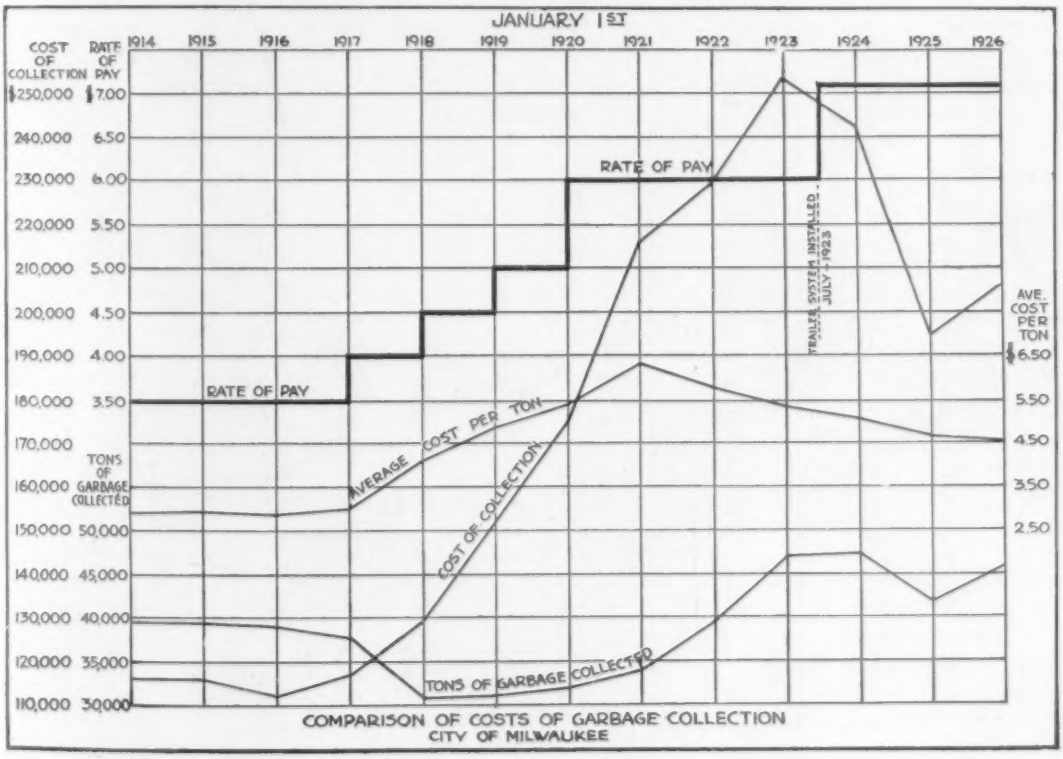
Prior to July, 1923, collections of garbage were made in water-tight wagon boxes drawn by single horses. This system was not proving satisfactory and the cost of collection per ton of refuse was mounting very fast from year to year. Many irregularities existed and the average number of complaints of inadequate collection was as high as 2,000 per month.

In July, 1923, this system was abandoned, thirty-one trailers were placed in operation, and others as rapidly thereafter as they were delivered from the factory. On October 1, 1923, there were seventy trailers in service. Additional trailers were purchased in 1924, 1925, and 1926, and at the present time there are in service:

Trailers of 3½ cubic yards capacity	46
Trailers of 4½ cubic yards capacity	227
Trailers of 5 cubic yards capacity	24
Heavy-duty tractor trucks	40

Type of Equipment

The type of trailer used by the city is of the side-dump style as manufactured by the



Highway Trailer Company of Edgerton, Wis. The first trailers installed were of 3½ cubic yards capacity, but experience has shown that the later installations of 4½ cubic yards capacity are better suited for garbage collection.

The cost of the 3½ cubic-yard trailers, as purchased by the city of Milwaukee, is $1,635, made up as follows: 2½-ton chassis, $945; 3½-cubic-yard side-dump body, $500; metal setts on each end of the trailer, $15; additional safety chains to prevent accidents in case the couplings separate, $12.50; tongue and whippletrees needed in ash and garbage collection, $17.50; brakes, $125; freight, $20. The cost of the 4½-cubic-yard trailer was $1,685, made up in the same way except that the 4½-cubic-yard side-dump body cost $50 more than the other.

The type of truck used to haul trains of trailers is a 5-ton heavy-duty tractor truck, as manufactured by the Sterling Motor Truck Company, of West Allis, Wis.

Method of Collection

At the present time the city is divided into fifteen districts, as shown on the accompanying map. Five of these districts, lying close to the incinerator, are called "direct haul" districts, since the individual trailers are hauled directly to the incinerator when filled, instead of being made up in trains. Two districts lying on the outskirts of the city are called "truck haul" districts because the garbage is collected in trucks and then hauled to the incinerator. The reason for this is the length of haul combined with the character of the territory served, the houses being few and far between.

Eight districts are known as "unit haul" districts. Each of these districts is divided into routes, which are divided into sections covered on various days of the week, and a certain team and trailer is assigned to work continuously on each route. During the summer months, provisions are made to collect garbage twice each week from the householder. During the winter months, when collections are made weekly, a different set of routes is laid out.

The trailers are drawn by a team of horses. Two men place the garbage in the trailer, one man working on either side of the alley or street. When the trailer is full it is covered with a canvas and hauled to a designated point in the neighborhood. At this point, at a designated time, a large tractor truck leaves an empty trailer and takes along the full one. The team is hitched to the empty trailer,

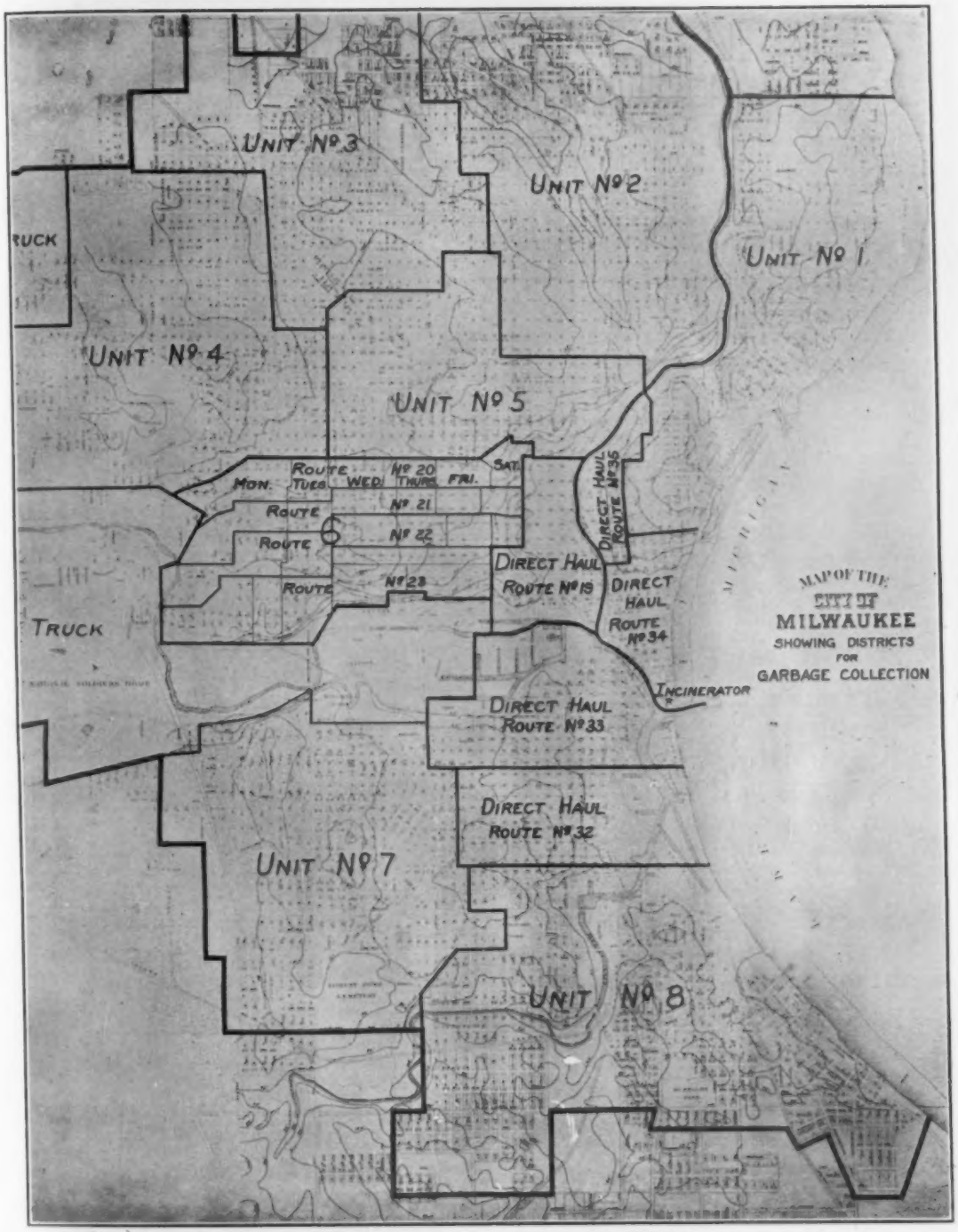
TYPICAL SCHEDULE OF COLLECTION

DIVISION OF GARBAGE COLLECTION—CITY OF MILWAUKEE
Winter Schedule—Effective September 28, 1925

Unit	Men in Field Start	Trailers at Station for Pick-Up				Truck Drivers Leave Plant
	A. M.	A. M.	A. M.	A. M.	P. M.	A. M.
I.....	6:00	8:00	10:00	12:00	2:00	7:15
II.....	6:15	8:15	10:15	12:15	2:15	7:25
III.....	6:00	8:00	10:00	12:00	2:00	7:05
IV.....	6:00	8:00	10:00	12:00	2:00	7:05
V.....	5:45	7:45	9:45	11:45	1:45	6:55
VI.....	5:45	7:45	9:45	11:45	1:45	6:55
VII.....	5:30	7:30	9:30	11:30	1:30	6:50
VIII.....	5:30	7:30	9:30	11:30	1:30	6:45

QUARTERLY SUMMARY OF GARBAGE COLLECTED IN MILWAUKEE

Year	Garbage Collected in Tons By Wagon	By Truck	By Trailer	Total	Rate of Pay Per Day Teamsters	Helpers	Tractor Men	Trailer Men	Total Cost of Collection	Average Cost per Ton
1921—1st Quar.....	7,142	.....	.....	7,142	6.00	....	....	....	$49,443.00	$6.92
2nd Quar.....	9,547	.....	.....	9,547	6.00	....	....	....	57,504.00	6.02
3rd Quar.....	13,034	.....	.....	13,034	6.00	....	....	....	64,824.00	4.97
4th Quar.....	9,837	.....	.....	9,837	6.00	....	....	....	57,231.00	5.81
Totals.....	39,560	.....	.....	39,560	....	....	....	....	229,002.00	5.79
1922—1st Quar.....	7,562	.....	.....	7,562	6.00	....	....	....	50,565.45	6.68
2nd Quar.....	11,120	.....	.....	11,120	6.00	....	....	....	62,631.85	5.63
3rd Quar.....	15,897	.....	.....	15,897	6.00	....	....	....	75,061.16	4.72
4th Quar.....	12,471	.....	.....	12,471	6.00	5.20	....	....	64,744.70	5.19
Totals.....	47,050	.....	.....	47,050	....	....	....	....	253,003.16	5.38
1923—1st Quar.....	9,410	.....	.....	9,410	6.00	5.20	....		53,961.15	5.73
2nd Quar.....	11,700	.....	.....	11,700	6.00	5.20	....	....	60,469.52	5.16
3rd Quar.....	7,542	366	7,400	15,308	9.00	5.20	7.40	5.20	75,076.06	4.90
4th Quar.....	1,060	377	9,432	10,869	9.00	5.20	7.40	5.20	52,725.39	4.85
Totals.....	29,712	743	16,832	47,287	....	....	....	....	242,232.12	5.10
1924—1st Quar.....	.....	438	6,654	7,092	9.00	5.20	7.40	4.80	41,121.25	5.79
2nd Quar.....	.....	414	9,813	10,227	9.00	5.20	7.40	4.80	49,052.36	4.79
3rd Quar.....	.....	475	13,808	14,283	9.00	5.20	7.40	4.80	55,432.55	3.88
4th Quar.....	.....	422	9,824	10,246	9.00	5.20	7.40	4.80	48,999.39	4.78
Totals.....	.....	1,749	40,099	41,848	....	....	....	....	194,605.55	4.65
1925—1st Quar.....	.....	335	7,079	7,414	9.00	5.20	7.40	4.80	45,540.13	6.14
2nd Quar.....	.....	345	10,696	11,041	9.00	5.20	7.40	4.80	53,279.31	4.82
3rd Quar.....	.....	430	16,573	17,003	9.00	5.20	7.40	4.80	57,727.86	3.39
4th Quar.....	.....	378	9,926	10,304	9.00	5.20	7.40	4.80	49,678.74	4.82
Totals.....	.....	1,488	44,274	45,762	....	....	....	....	206,226.04	4.50

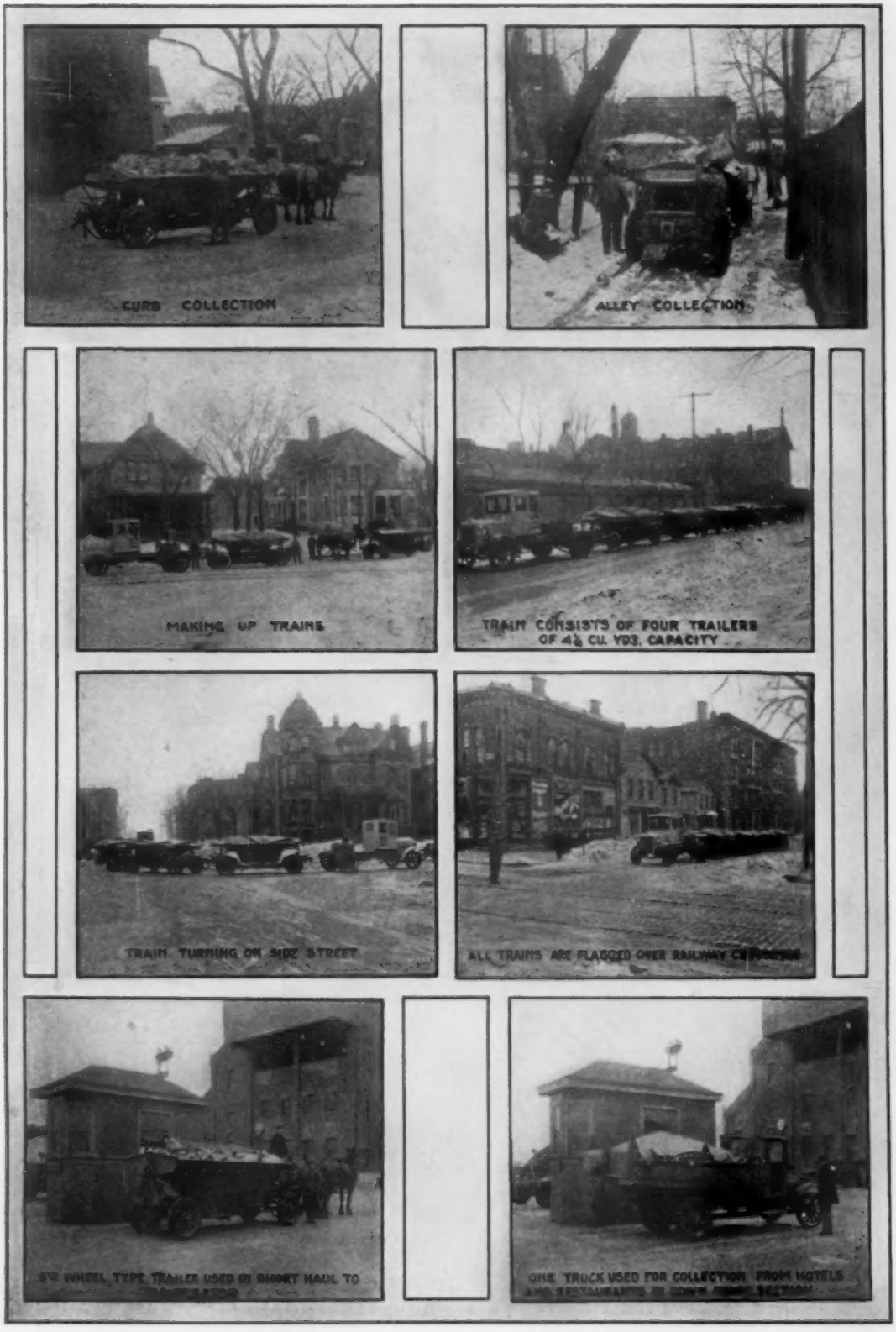


GARBAGE COLLECTION DISTRICTS IN MILWAUKEE, WIS.

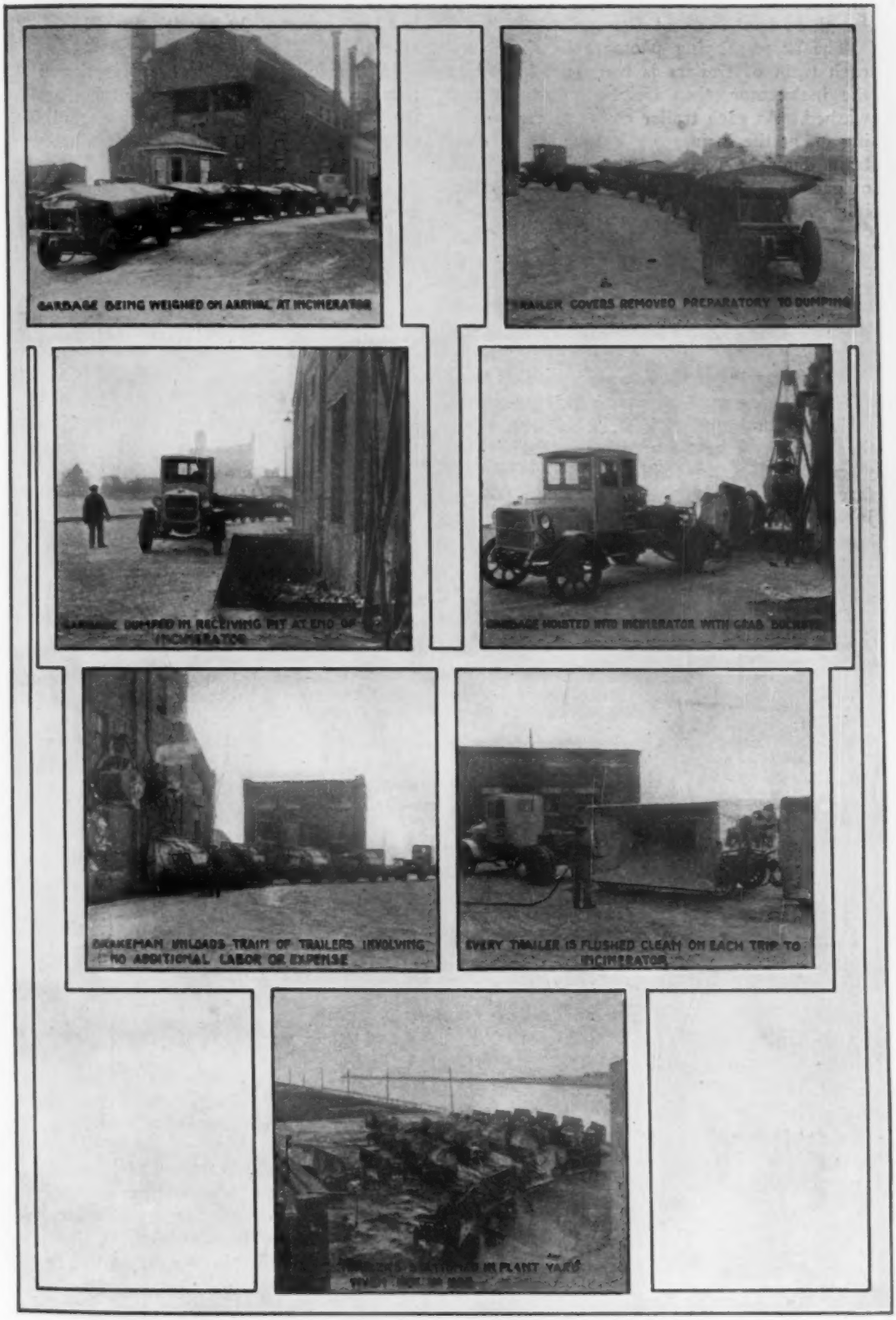
which in turn is again filled with garbage in the immediate vicinity. Two hours is allowed for filling a trailer with garbage, which makes it possible for a teamster and a helper to fill four trailers a day.

Hauling of Trailers

The trucks, except when the pavements are very slippery, haul four trailers on each trip. Each truck makes four trips per day to the incinerator, carrying a total of sixteen trailer loads. The system of drawing the four trailers has made it possible to utilize the speed and great carrying capacity of large trucks to the greatest advantage. They haul large loads great distances; some of them running


CURB COLLECTION
ALLEY COLLECTION
MAKING UP TRAINS
TRAIN CONSISTS OF FOUR TRAILERS OF 4½ CU. YDS. CAPACITY
TRAIN TURNING ON SIDE STREET
ALL TRAINS ARE FLAGGED OVER RAILWAY CROSSING
ONE TRUCK USED FOR COLLECTION FROM HOTELS

GARBAGE COLLECTION AND DISPOSAL


GARBAGE BEING WEIGHED ON ARRIVAL AT INCINERATOR
TRAILER COVERS REMOVED PREPARATORY TO DUMPING
GARBAGE DUMPED IN RECEIVING PIT AT END OF INCINERATOR
GARBAGE HOISTED INTO INCINERATOR WITH GRAB BUCKET
BRAKEMAN UNLOADS TRAIN OF TRAILERS INVOLVING NO ADDITIONAL LABOR OR EXPENSE
EVERY TRAILER IS FLUSHED CLEAN ON EACH TRIP TO INCINERATOR

PICTORIALLY SHOWN IN MILWAUKEE, WIS.

as much as fifty miles per day. The average length of haul is about four miles.

The accompanying photographs show how each train of trailers is made up, hauled to the incinerator, then weighed, dumped, and washed. As each trailer comes to the receiving pit at the incinerator, the helper on each train dumps the trailer, and the entire load of garbage slides into the pit while the trailer is slowly passing.

The summer schedule of garbage collection, which starts about May 1 of each year, is identical with the winter schedule, with the exception that all employees start their work two hours earlier in the day.

Quantity of Garbage Collected

The table on page 374 shows, by three-month periods from January, 1921, to October, 1925, the total amount of garbage collected by wagons, trucks, and trailers. As stated before, the trailer system was inaugurated in July, 1923, and by the end of that year all horse-drawn collection had been eliminated.

Cost of Garbage Collection

The net cost of garbage collection is also shown in the table above. The figures submitted cover the following costs of collection:

A—Personal Service
1. Direct labor.
2. Truck drivers and trailermen.
3. Supervision and inspection.

B—General Service
1. Minor repairs.
2. Supervisional auto service.

C—Equipment Service
1. Operation, repair service, labor, and materials on trucks and trailers. To cover this, the Bureau of Garbage Collection and Disposal is charged $6.40 per day for tractor trucks; $3.50 per day for 2½-ton trucks; and $0.50 per day for trailers by the Bureau of Municipal Equipment.

Attention is called to the marked decrease in cost as soon as the trailer system was started. This decrease was secured in spite of the fact that the rate of pay of the teamsters was increased 50 per cent and that large areas of land were annexed to the city, thus increasing the length of haul.

A comparison of the cost of garbage collection from 1914 to 1926 is shown also by the accompanying graphs.

Service Rendered

Since the service rendered to the public is an important criterion of the success or failure of a system, it is worth while to see what has been accomplished under the old and new systems.

In the following table there is shown the number of complaints from householders for the years 1922 to 1925, inclusive, and it is noteworthy that the monthly complaints were reduced from an average of 2,000 in 1922 to an average of about 300 in 1925. The maximum monthly complaints in 1922 was 4,393 and in 1925 was 678.

TABLE OF COMPLAINTS RECEIVED

	1922	1923	1924	1925
January	No record	731	1,219	621
February	No record	571	768	305
March	No record	488	375	201
April	1,499	723	471	230
May	2,346	949	533	103
June	2,636	2,420	915	334
July	2,694	3,634	1,201	351
August	3,847	6,858	813	678
September	4,393	3,809	481	480
October	2,556	1,457	230	46
November	1,626	998	219	74
December	1,485	1,220	486	123
Total	23,082	23,858	7,711	3,546

Flexibility of Equipment

While the truck and trailer system was instituted primarily for the collection of garbage and ashes and is largely used for that purpose, it was found so flexible that it is also used by many city departments for a great many purposes.

In the winter months the equipment is used for the removal of snow after heavy storms. The Sewer Department, Street Construction Department, Bureau of Electrical Service, Bureau of Bridges and Buildings and Sewerage Commission use the equipment for the cartage of construction materials and the removal of wastes. Then, too, the 5-cubic yard trailers are used to haul crushed stone from the municipal quarry.

The type of heavy-duty tractor trucks used for hauling trailers has also proved advantageous for many other purposes, and since each day's collection of garbage is completed by noontime during the summer schedule, the tractor trucks are used on other work.

Conclusion

In conclusion, it can be stated that the trailer system of collection, as used in the city of Milwaukee, has proved satisfactory. It has proved satisfactory because of the fine service rendered, the lowered cost of collection, and the ease of operation. This, combined with flexibility in the use of the equipment for a variety of other work, makes it a system difficult to excel.

ACKNOWLEDGMENT.—From a paper read before the Engineering Society of Wisconsin.

These Small Cities Have Earned a Twofold Reward—

Better Fire Protection and Lower Insurance Rates

From the New England Insurance Exchange, Boston, Mass.

NATICK, MASS.—A few years ago we had occasion to issue recommendations to this town. Some of the improvements suggested were carried out from time to time. Recently at the request of the selectmen we checked these up and, while it was found that the town had not fully complied with our original recommendations, there was sufficient improvement as measured by our point system of grading to permit a reduction of rates. This reduction amounted to about 5.9 per cent on brick dwellings and about 9.1 per cent on frame dwellings. The important items of improvement found in the fire protection consisted of the replacement of antiquated fire apparatus by two motor pumping engines and a motor-driven ladder truck, six additional permanent firemen, a new water-works pump, and numerous supporting mains in the water distribution system. At the time the reduction on dwelling property was made, the town requested information on how to obtain lower rates under the Analytic System of Schedule Rating for mercantile and similar property. This was furnished, and within one year, through energetic work by interested citizens, our recommendations were carried out and rates under this schedule were reduced.

DANVERS, MASS., after receiving our recommendations, appointed a committee which consulted with this Exchange many times as to their best procedure. This consisted of appointing a full-paid chief, who was selected from a large city near-by; consolidating a number of volunteer companies in outlying districts; constructing two new fire-stations in which the companies were consolidated; purchase of two new motor pumping engines and a motor ladder truck; adding four permanent men and instituting a proper system of drills for the fire department personnel.

COVENTRY, R. I.—In the Coventry Fire District in this town, through the efforts of an energetic chief of fire department over a period of years of constructive work, it has been possible to grant a reduction in rates. The factors contributing to the improvement of the fire protection features were the establishment of permanent tenure of office for the chief, a new fire department headquarters, improvements in fire department equipment, housing the fire-alarm system in a fire-proof building, revamping and improving the fire-alarm system, and adoption of building laws along the lines recommended by the National Board of Fire Underwriters.

Intelligent Action on Expert Advice

The accompanying are some of the replies received to The American City's request for information as to small cities which have been able to secure lower insurance rates and reduce their fire losses as a result of cooperation with their respective rating bureaus and insurance exchanges.

A composite set of recommendations covering in a general way improvements suggested to various small municipalities by the Schedule Rating Office of New Jersey, was published last month (pages 318 and 319).

For a list of rating bureaus and similar organizations, with a map of the territory covered by each, see The American City for March, 1925, pages 329-331.

From the West Virginia Inspection Bureau, Columbus, Ohio

All cities and towns in our territory are classified in accordance with predetermined standards covering protective features and are placed in one of a number of different grades. We accordingly are called upon occasionally to change a community from one grade to another following the carrying out of certain necessary improvements which we have recommended. The most material change occurs when a community which has previously been without a public water-works system installs one which meets with our approval and provides the necessary fire-fighting equipment.

OAK HILL, W. VA.—This is a rapidly growing coal town, whose fire record had previously been bad. The town now has a very

acceptable water-works system and a substantial piece of fire apparatus in charge of a volunteer department, and rates throughout the village have been materially reduced.

BLUEFIELD, MOUNDSVILLE, and WELD, W. VA.—In the past several years this bureau has had occasion to give a better classification to these three municipalities, all of which have bettered either their fire department or water-works facilities, or both. The most extensive changes were made by Bluefield. This included the building of a 100,000,000-gallon storage reservoir, the installation of additional pumping facilities, adding more men to the fire department, purchase of additional fire equipment, including an aerial truck, and the institution of a system of building inspection. As a result, the city is enjoying considerably lower rates and its losses are nominal.

BECKLEY, W. VA.—This is one of the most recent and interesting examples we have had. Beckley is a prosperous and very rapidly growing community, which had had perhaps the worst loss record for its size of any town in the state. This town, while enjoying a protected classification, was about to have it withdrawn on account of its lack of interest in adequate fire prevention and protection. This change on our part would have meant a very material increase in the cost of insurance throughout the community. Confronted by this possibility, the Chamber of Commerce and business men undertook to better conditions and carry out the recommendations made by the Bureau. Although the water system was privately owned, the management agreed to cooperate in a very commendable way. A very inadequate and unreliable water-supply was strengthened by running a long pipe line several miles from one of the coal workings to the pumping-station. A second force main from the station was laid to the town, a 1,000,000-gallon storage tank erected, the number of hydrants increased from less than 20 to over 50, and various other points in the system were reenforced by the laying of additional and larger water lines, the company agreeing to install nothing less than 6-inch lines.

FIRE DEPARTMENT, BECKLEY, W. VA.

There was no fire department organization or equipment of any value. A very competent man and former officer in the Charleston, W. Va., fire department, was secured to organize a volunteer department. He now has charge of fire-fighting activities, with a full-paid assistant and six well-trained volunteers. A standard piece of motor equipment carrying a 600-gallon pump was next purchased, together with a suitable supply of hose. The community, however, owned no city building, and the department was accordingly housed in very crowded and unsuitable quarters. Negotiations were then open for the purchase of an abandoned brick church building advantageously located at the edge of the mercantile district. This building has since been acquired, entirely remodeled, the old bell tower was converted into a hose-drying tower, an electric siren was installed and a very acceptable station provided. The fire chief immediately began a system of building inspection, and obtained very excellent cooperation.

For the year preceding the installation of protection the losses amounted to about $200,000, the population of the town being less than 5,000, this representing about an average year. For the period covering fire department activities, which will soon be a year, the losses up-to-date amount to less than $12,000 in Beckley proper, while the department has also aided in saving properties of several large coal operations outside the village.

Since the foregoing report was received, Fire Chief J. L. Guthrie has written THE AMERICAN CITY that the Department now has four regular firemen and four volunteers, with the 600-gallon American-LaFrance triple-combination pumper, and 65 water-plugs.

(Reports from other inspection and rating bureaus will be published in the May Number.)

Experience with Sludge Digestion at the Baltimore Sewage Works

By C. E. Keefer

Engineer of Sewage Disposal, Bureau of Sewers, Baltimore, Md.

THE digestion of sewage sludge in separate tanks is not a new process. It has been in use at Birmingham, England, Toronto, Canada, Birmingham, Ala., and at Baltimore from 1912 to the present time. There are also a number of smaller sewage works in this country where this method of sludge treatment is in vogue. Furthermore, several sewage works in Germany have been provided with these tanks.

Within the past few years there has been a renewed interest in this country in this method of sludge treatment. Probably one reason has been the difficulties which some operators of sewage works have had with Imhoff tanks. One advantage of separate digestion tanks over Imhoff tanks is that the sludge is entirely separated from the sewage, and therefore the excessive foaming and other difficulties encountered in Imhoff tanks are not present. Perhaps one other reason why more sludge digestion tanks are being installed is that mechanical means have been devised for removing daily the sludge from sedimentation tanks. This procedure has naturally meant the installing of digestion units. Moreover, the use of separate digestion tanks is one of the older processes of sewage treatment, and the number of advocates for its use are gradually increasing.

Odors from Sludge Tanks

One of the objections to the use of sludge digestion tanks has been the fear that considerable odor would come from them. The claim is made that when large areas of this material are exposed to the atmosphere, considerable odor arises, which travels for some distance. On the face of it, such a condition would seem to be true. The observations made over a number of years by those who have been in close touch with the Baltimore sewage works do not bear out this conclusion. The odors coming from the plant are extremely variable.

In operating the sludge tanks, the fresh and undigested material is introduced at a point below the surface of the sludge. The reason for this procedure is to keep the undigested sludge from coming in contact with the air, for if a relatively small stream of this material is allowed to pass through the atmosphere, there will be some odor.

FIG. 1.—SLUDGE ON THE SURFACE OF SEPARATE SLUDGE DIGESTION TANKS, SHOWING THE FORMATION OF THICK CAKES

If comparisons are made between the sludge exposed to the atmosphere in an Imhoff tank sewage works and in a separate sludge digestion tank installation for the same flow of sewage, it will naturally be found that the exposed area in the latter case is considerably in excess of the former. The surface material in both cases, however, is frequently very much the same in character. After being exposed to the atmosphere for several days, it usually forms into a hard crust which has a low moisture content and little odor. The upper 6 or 8 inches of this crust is usually a porous and dry, fibrous material which is well digested. As long as the crust remains intact, it acts as a blanket and helps to keep the odors from escaping to any great extent.

Sludge in Imhoff Tanks and in Separate Digestion Tanks

An opportunity has been afforded to observe and study the sludge from Inhoff tanks and from sludge digestion tanks at the Baltimore

THE BACK RIVER-SEWAGE WORKS
HIGHWAY DEPT. SEWER DIVISION.

SLUDGE DIGESTION TANK NO.
OPERATION FOR 19___ Capacity. Cu.Ft. to top

Sludge Introduced						Sludge or Liquid Removed					
Date	Moisture %	Volatile Matter %	Feet	From	Character	Date	Moisture %	Volatile Matter %	Feet	Point of Disposal	Character
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)

FIG. 2.—FORM USED TO RECORD RESULTS OBTAINED IN SEPARATE SLUDGE DIGESTION TANKS

works, where both kinds of tanks have been used. So far as can be determined, there is no difference in the digested sludge from these types of tanks. In each case, the digested sludge has the same tarry odor, cracks well, and dries readily on sludge beds. The sludge from the digestion tanks, however, has a higher moisture content than from Imhoff tanks. The average moisture of the sludge put on the drying beds from 1920 to 1924 has been 91.8 per cent. With such a sludge, more drying-bed area is needed than if deep Imhoff tanks were used.

Degree of Digestion at the Baltimore Works

During the winter months the digestion process slows up considerably; so it is necessary to provide for sufficient sludge capacity to store all of the sludge removed from the sedimentation tanks until it can be dried in the spring. As a general rule, little sludge can be drawn from the digestion tanks from the first of November until the first of April. In the summer and early autumn most of the digestion occurs. From 1915 to 1924, inclusive, the sludge has decreased in volume an average of 49 per cent on account of gasification and liquefaction. As partially digested sludge has been removed from the tanks on many occasions, this decrease would have been greater had the digestion been allowed to continue further.

Design of Separate Sludge Tanks

There are many features with reference to the design of sludge digestion tanks. The first of these pertains to the mixing of digested and undigested sludge. Some means should be provided to accomplish this purpose, either by a stirring device of some sort or by mixing undigested with digested sludge by means of pumps, as is done at Birmingham, England. Provision has been made for doing this at Baltimore, but some time will be needed to get accurate data on the results obtained.

The question is often asked whether large digestion units give as good results as small ones. At Baltimore the sludge tanks vary in size from 20,600 to 204,200 cubic feet. So far as can now be told, as good results are obtained with one type of unit as with the other. In a large plant it would seem more logical to build large units, as they cost less. In a small sewage works it is likely that at least two or three units should be installed for the purpose of flexibility. The building of several sludge inlets and outlets at different elevations in each sludge tank at Baltimore has proved to be a wise policy, as digested sludge is frequently found at various elevations in the sludge tanks, and provisions are thus made to remove it.

It is difficult to determine the amount of sludge storage space to provide per capita. This figure will naturally depend upon the amount and character of the settling solids in the untreated sewage, the efficiency of the settling tanks, the average annual temperature, the way in which the sludge is removed from the settling tanks to the digestion tanks, and, no doubt, upon many other factors which are as yet unknown. It is estimated that on January 1, 1925, 3.73 cubic feet per capita were available at the Baltimore works for the digestion of sludge, based on a free-board of 2.0 feet in all the digestion tanks. The average quantity of undigested sludge from 1915 to 1924, inclusive, was 0.25 cubic yards per year per capita, and 7.17 cubic yards per year per million of gallons of sewage. From the observations made during the past year or 18 months, the above-mentioned volume per capita is none too great, and probably it will have to be increased to 4.0 or 5.0 cubic feet before the best results will be obtained.

Some Recent Observations on the Digestion of Sludge

In order to obtain some ideas about the speed of digestion during the summer months,

observations were made on the sludge in one of the circular sludge units. This tank, which has a capacity of 20,600 cubic feet, is 38 feet in diameter, with a cone-shaped bottom. The distance from the top of the tank to the sloping bottom is 15 feet, and the total depth at the center is 24 feet. 6 inches.

On July 24, 1925, the tank was filled by adding 10,170 cubic feet of undigested sludge. Most of the sludge already in the tank was partially digested. From this date until October 2 no sludge was added or removed. Table 1 gives data on the observations which were made:

TABLE I—SHOWING THE REDUCTION OF VOLATILE MATTER FROM JULY 23 TO OCTOBER 2, 1925

Date Sample of Sludge was Taken	Characteristics of Sample of Sludge		Temperature	
	Volatile Matter	Odor	In Tank Degrees	In Atmosphere Degrees
(1)	(2)	(3)	(4)	(5)
July 23...	67.7	Not Recorded	64.1	75.7
Aug. 3...	56.3	" "	67.5	76.2
" 10...	50.8	Slightly Tarry	67.5	78.6
" 17...	52.0	Tarry	67.2	73.2
" 24...	51.2	"	67.0	73.9
" 31...	50.3	"	67.0	76.9
Sept. 15...	49.1	"	67.8	74.8

Before discussing Table I it should be emphasized that it is always very difficult to get representative samples of sludge in a tank the size of the one used. In studying Column 2, which shows the volatile material in the sludge, this point should be considered, and the results interpreted with caution. Perhaps the appearance and the odor of the sludge is the best index as to whether it is digested or not, but in order to apply some quantitative standard to represent the degree of digestion, the per cent of volatile matter in the sludge has been adopted in this discussion. This method of measurement will vary with the character of the sludge and especially the amount of inorganic material, and is not entirely accurate. At the Baltimore works undigested sludge usually contains about 75 per cent or more of volatile matter, and digested sludge about 55 per cent or less of volatile matter. From July 23 to August 10, a period of 19 days, the volatile matter in the sludge decreased from 67.7 to 50.8 per cent. During this period the digestion was evidently rapid, but from August 10 to September 15, a period of 36 days, the digesting process had slowed up considerably, the volatile matter being 50.8 per cent on August 10, and 49.1 per cent on September 15. The temperature observations of the sludge, which ranged from 64.1 to 67.8 degrees, were made at a depth of 18 feet from the surface with a self-recording thermometer, which also recorded the temperature of the atmosphere continually.

On October 2, 1925, samples of the sludge were taken in this tank along its center line at various distances from the top. Table II gives the observations which were made:

TABLE II—CONDITIONS OF SLUDGE AT VARIOUS LEVELS IN SLUDGE DIGESTION TANKS

Sample No.	Distance Below Top of Tank Ft.	Remarks
(1)	(2)	(3)
1	3.5	2.5 inches of scum
2	6.0	Thin sludge-digested-dark
3	8.0	Water
4	10.0	Water
5	12.0	Water
6	14.0	Water
7	16.0	Water
8	18.0	Thin sludge-digested-dark
9	20.0	Heavy sludge-digested-black

During the many times that this tank was observed there was not a great deal of gasification, although it is evident that there was considerable liquefaction.

Operation of Sludge Tanks

In addition to what has been said above with regard to the operation of sludge tanks,

FIG. 3.—BACK RIVER TREATMENT WORKS, BALTIMORE, MD., SHOWING THE SLUDGE IN DIGESTION TANK NO. 1 BEGINNING TO GASIFY

FIG. 4.—SLUDGE TANK, SHOWING GASIFICATION OVER ENTIRE TANK

the following is worthy of note. Accurate records should be kept of the operation of the tanks. At Baltimore, where there are 51 sludge tanks, a record sheet as shown by Figure 2 is used for each tank. This sheet shows the date, moisture, volatile matter, quantity, and character of the incoming sludge, together with the tank from which the sludge was pumped, and also the same information for the sludge or liquid which is removed. These sheets are of special value for reference.

Ordinarily, sludge is removed from the tanks by gravity or by pumping directly to the sludge drying beds. Frequently the sludge is pumped from one tank to another for the purpose of mixing it. The sludge when it enters the tanks has a moisture content of a little above 93 per cent. Some of this water separates from the solid material, and, furthermore, more is formed through liquefaction. Previous to this year, this liquid flowed on the sludge drying beds, but at the present time it is pumped to the inlet end of the preliminary sedimentation tanks.

Varying Condition of the Sludge Tank

As is to be expected, the sludge tanks do not always function in the same manner. During the winter months the top surface of the sludge becomes frozen over for a depth of several inches. In the spring the surface thaws, and under normal conditions a dry scum varying from a few inches thick to a foot or more can be observed. Later on during the summer, gasification begins at first in a few spots on the surface. This gas can often be observed as it escapes from the water between the cracks in the scum. If this action is sufficiently violent, a crater of sludge, which gasses violently, will be formed, varying in diameter from a few inches to as much as three feet or more. Occasionally this action will proceed with great rapidity. The thick surrounding scum will become submerged below the grayish, foam-like material, and large quantities of gas will be evolved. Figure 3 shows a portion of one of the tanks in which foaming has just started, and Figure 4 shows the same tank eleven days later, foaming and gasifying over practically its entire surface.

Figure 1 shows the condition where a thick mat of scum, which will bear the weight of two or more persons, has formed over the top of the tank. The scum dries out to such an extent that its moisture content will often be below 40 per cent. This condition is the usual one at the Baltimore works. In one respect it is unfortunate that this condition cannot be avoided. It is naturally impossible for this material to flow through the sludge pipes, and the only present means available of getting it to the sludge beds is to add water under pressure. This means that the moisture content has to be raised to about 92 per cent, and then the sludge has to be air-dried to remove the water. This whole proceeding produces a good deal of lost motion, and adds to the expense of operation.

Conclusions

It is unfortunate that more study was not given to the separate sludge digestion process during the past 20 years. It is only during

the past few years that any great attention has been given to it. Practically no experimental work was done at Baltimore on separate sludge digestion until a few years ago. This work is being continued, and it is hoped that at the end of the next four or five years considerable information of value will have been obtained.

The following are a few of the conclusions to be drawn from the thirteen years of study and operation at Baltimore.

1. Well-digested sludge which is free from offensive odor and which will dry rapidly on sludge beds can be obtained from separate sludge tanks. Unless these tanks are as deep as Imhoff tanks, the sludge will contain more water and a relatively larger area of sludge drying beds will be needed.

2. Experience at Baltimore would indicate that more digestion space is needed than in Imhoff tanks. The chief reason for this is that the water content of the sludge is higher.

3. The design of a large sludge digestion plant will differ materially from a small plant. In a large plant pumps should be installed for pumping sludge to remote sludge beds where it ordinarily would flow by gravity, and also for the purpose of mixing the sludge. Methods should be available for removing the excess water from the tanks and disposing of it in a satisfactory manner. Water under pressure should be available so that it can be added to sludge with a low moisture content in order to remove it to the drying beds.

4. As to whether Imhoff tanks or settling tanks with digestion units should be installed at any proposed sewerage project, it should be determined only after a careful study of the two methods of treatment have been made, and after cost estimates have been prepared. Each method of treatment has its advantages and its disadvantages, and a careful weighing of them should be made.

ACKNOWLEDGMENT.—From a paper read before the American Society for Municipal Improvements, at Des Moines, Iowa.

An Interesting Street Report from Buffalo, N. Y.

STREET paving in Buffalo, N. Y., is under the direction of the City Engineer, who has developed a system whereby not only every cent spent on each and every street for maintenance is recorded, but also a profile plan is available and kept constantly up to date, showing the exact location and dimensions of every patch and the year the patch was applied.

Buffalo's latest report is for the fiscal year July 1, 1922, to June 30, 1923, and July 1, 1923, to June 30, 1924. The following is the total pavement mileage and yardage up to January 1, 1924:

Type	Miles	Square Yards
Asphalt	345.63	5,787,029
Brick	50.03	770,961
Second-class stone	43.76	.....
Block stone	32.46	1,320,819
Macadam	12.23	219,089
Wood block	.66	10,520

In recording pavement maintenance for various types of pavements, Buffalo's report differentiates between "streets maintained" and "streets repaired only." In the case of "streets maintained," the total maintenance cost is apportioned to the total yardage of each type of pavement in the entire city. In the case of "streets repaired only" the total maintenance cost is apportioned to the total yardage contained only in those streets on which the actual repairs were made. With this explanation, the report gives the following official maintenance figures:

Type	Cost Per Square Yard for Each Square Yard Repaired	Cost Per Square Yard on Streets Maintained	Cost Per Square Yard on Streets Repaired
Asphalt	$1.90	$0.1213	$0.1569
Common stone	....	0.0064	....
Block stone	1.34	0.3883	0.0867
Macadam	....	0.0549	0.0556
Brick	1.06	0.0133	0.0719

The foregoing figures are on pavements not covered by the 10-year guarantee. The following figures represent pavements both in and out of guarantee:

Asphalt laid up to and including 1924, 7,910,519 square yards.
Asphalt taken up during city's history, 2,109,773 square yards, or 26 per cent.
Brick laid up to and including 1924, 779,542 square yards.
Brick taken up during city's history, 24,455 square yards, or 3 per cent plus.

Of repairs made between July 1, 1923, and June 30, 1924, on pavements out of guarantee, the following division is made: of the 3,244,536 square yards of asphalt maintained, there were 206,559.08 square yards of repairs, or 6.37 per cent of the total asphalt yardage. Of the 526,336 square yards of brick maintained, there were 6,569.93 square yards of repairs, or 1.3 per cent of the total brick yardage.

THE RIGHTS OF PROPERTY HOLDERS

"We think that it is a settled principle, growing out of the nature of well-ordered civic society, that every holder of property, however absolute and unqualified may be his title, holds it under the implied liability that his use of it may be so regulated that it shall not be injurious to the equal enjoyment of others having an equal right to the enjoyment of their property nor injurious to the rights of the community."—MASSACHUSETTS SUPREME COURT.

Final Report of the Second National Conference on Street and Highway Safety

Adopted at Washington, D. C., March 25, 1926

EDITORIAL NOTE.—*The following is the full text of the consolidated final report of the second National Conference on Street and Highway Safety. This conference, held in Washington, D. C., March 23-25, at the call of Secretary of Commerce Herbert Hoover, was attended by official delegates appointed by the governors of 43 states, and by many municipal officials, city planners, traffic engineers, and chiefs of police, as well as by representatives of national and local groups such as safety councils, automobile clubs, chambers of commerce, insurance companies, steam and electric railroads, public service commissions, state highway officials, taxicab owners, organized labor, auto vehicle administrators, educators, and women's organizations.*

The six new committee reports which are abstracted in the following consolidated report are obtainable, without charge, on application to the National Conference on Street and Highway Safety, Department of Commerce, Washington, D. C. From the same source the eight reports of the first National Conference on Street and Highway Safety, to which reference is also made, may likewise be obtained by persons, not already possessing these reports, interested in highway safety and traffic problems.

THE purposes which brought the National Conference on Street and Highway Safety into existence in the spring of 1924 have in part been accomplished, but very much remains to be done. These purposes were, first, to focus public attention on the appalling increase in street and highway accidents, and, second, to develop a comprehensive program for improvement of traffic conditions and reduction of accidents, upon which all concerned, including state and municipal officials and others interested, could agree.

The losses of life, personal injuries and destruction of property in traffic accidents have been estimated at an economic loss of $600,000,000 annually, and additional losses resulting from congestion and other causes incident to inadequate traffic facilities bring the estimated total loss in the United States due to all these causes to more than $2,000,000,000 per annum.

The awakening of public consciousness is not only shown in the widespread attention which has been given to the subject throughout the country, but is also reflected in an apparently favorable change in the trend of the accident record, which, up to and including 1923 was mounting at a progressively increasing rate, but which in 1924 showed a much lower rate of increase. In many jurisdictions in 1925 the number of fatalities was kept down to and in some cases reduced below the 1924 figures. The widespread publicity resulting from the Conference itself, and the work of the participating organizations and other interested groups, have had a marked influence in bringing to all classes of the population concerned a realization of their responsibilities in dealing with this problem. There is urgent need, however, that this be translated into further remedial action.

A program of specific remedial measures has been developed by the Conference, first, through the surveys carried on in 1924 by eight special committees dealing with the essential elements of the accident reduction problem and, second, through the supplementary committee reports prepared for the present conference.

Continuing Value of Former Reports

For the benefit of states and communities having to deal with the problems of traffic and accident reduction, this Conference desires to emphasize the continuing value of the reports rendered to the First Conference by the following committees:

1. Committee on Statistics
2. Committee on Traffic Control
3. Committee on Construction and Engineering
4. Committee on City Planning and Zoning
5. Committee on Insurance
6. Committee on Education
7. Committee on the Motor Vehicle
8. Committee on Public Relations

These reports, with but slight changes, were adopted by the First Conference, after thorough consideration, and summarized by that Conference in its report of legislative principles, administrative and regulatory principles, and suggestions for cooperative work. This Conference recommends that the reports of the Committees of the First Conference, and the report of that Conference itself, be made available to all who may have occasion to use them.

New Reports Now Available

The committee work done in preparation for the Second Conference has been primarily designed to develop further and put in more available form the recommendations made by the First Conference. The new reports include those of:

(a) *The Committee on Uniformity of Laws and Regulations,* which presents a suggested model for a uniform vehicle code, developed with the cooperation of the National Conference of Commissioners on Uniform State Laws, and dealing with registration, certificate of title, licensing of operators and chauffeurs, rules of the road, regulations governing the operation of vehicles on highways, and adequate signing of the highways, together with suggestions for the development of uniform municipal ordinances and uniform state and municipal regulations.

(b) *The Committee on Enforcement,* which recommends measures of organization and procedure to secure better enforcement of the laws and regulations affecting street and highway safety.

(c) *The Committee on Causes of Accidents,* which gives such information as is available as to the causes of accidents and outlines a program for determining the causes of accidents with a view to their elimination.

(d) *The Committee on Metropolitan Traffic Facilities,* which outlines a program for improvement of traffic facilities and recommends suitable plans of organization for its accomplishment.

(e) *The Committee on Statistics,* which presents essential facts of the accident record together with its recommendations as to improvement in the collection and analysis of accident statistics.

(f) *The Committee on Public Relations,* which proposes measures for putting into effect the recommendations of the Conference through action of the participating organizations.

After reviewing these reports, this Conference is of the opinion that, taken together with the reports of the 1924 Conference mentioned above, they constitute a sufficiently complete program for present purposes, and that the problem to which special attention should be directed is that of putting this program into effect.

The Conference submits the following outline of its recommendations, the details of which are found in the reports of the committees and in the report of the First Conference.

Traffic Laws and Regulations

1. A Uniform Vehicle Code, including (1) A Uniform Motor Vehicle Registration and Certificate of Title Act, (2) A Uniform Vehicle Operators' and Chauffeurs' License Act, and (3) A Uniform Act Regulating the Operation of Vehicles on Highways, should be enacted by each of the states and the District of Columbia. A suggested model for such a code is contained in the report of the Committee on Uniformity of Laws and Regulations which, with modifications approved by the present Conference and embodied in Appendix A,* is endorsed by this Conference and is recommended to the National Conference of Commissioners on Uniform State Laws and to the several state legislatures as the basis for uniform legislation on the subject.

2. The Uniform Vehicle Code should be supplemented by state administrative regulations which should, as far as practicable, be developed on a uniform basis through cooperative action of the associations of officials concerned, particularly the state highway officials and motor vehicle commissioners, together with joint committees, including other public officials and representatives of automobile clubs, scientific organizations and commercial and other bodies concerned.

3. The Uniform Vehicle Code should further be supplemented by local traffic ordinances with regard to which progress toward uniformity should be sought through state or regional conferences of officials and other persons or organizations interested.

EDITORIAL NOTE.—The code and appendix are obtainable without charge on application to the National Conference on Street and Highway Safety, Department of Commerce, Washington, D. C.

4. Local traffic ordinances should also be supplemented by the necessary detailed rules and regulations to be established by local authorities, and uniformity in such regulations should be secured through the associations of officials concerned, with the cooperation of other persons and organizations interested.

5. In view of the fact that fatal collisions of motor vehicles with pedestrians, already amounting to 60 per cent of the total number of fatal traffic accidents, are increasing at a rate out of all proportion to the rate of increase in other traffic fatalities, the education and regulation of pedestrians as well as of drivers should be given greater attention than at present. Pedestrians and motorists should bear a considerate attitude each to the other. Along rural highways, wherever there are suitable sidewalks or paths, pedestrians should use them. Where there are none, they can generally walk most safely on the left-hand side facing the traffic, having due regard to danger at curves, but should not force motor traffic out of line or otherwise impede it. In cities pedestrians should be instructed, urged, and required to keep within the boundaries of designated safety zones and crossing places and, when there is congestion, to cross only with the traffic. Motorists should be required to accord pedestrians safe and dignified use of such safety zones and crossing places. Pedestrians as well as motor vehicle operators should be required to obey the traffic rules and regulations and should be punished by adequate fines for failure to do so.

6. Additional legislative and administrative measures should be adopted as hereinafter recommended for enforcement of the traffic laws and regulations, public education in traffic safety, street and highway planning, construction and maintenance, railroad grade-crossing protection and elimination, and other measures for improvement of the traffic situation.

Enforcement of Traffic Laws and Regulations

7. State laws should prescribe a uniform system of enforcement to be applied in part by the state courts and administrative machinery and in part by the local authorities. The necessary special traffic control and traffic patrol police should be provided and the regular police should participate in traffic enforcement. Provision should be made for prompt and thorough collection of evidence and investigation of accidents; for special traffic courts or special traffic sessions of general courts, and traffic violations bureaus with a schedule of penalties for disposing of minor infractions, so as to give the courts more time to deal adequately with more serious cases; uniform permanent records of all convictions of traffic violations and of traffic accidents, suspensions and revocation of operators' licenses and refusals to grant licenses; and exchange of detailed information between jurisdictions as to suspensions and revocation of licenses and convictions for serious traffic offenses. Neither the traffic officers nor the court judges should receive any fees from the money collected from traffic convictions.

8. The courts and the police, through vigorous enforcement and evenhanded treatment of offenders, should instill in the public respect for the traffic laws and regulations.

9. Public opinion in support of enforcement

should be organized through a representative citizens committee in each locality, forming part of an organized effort of all elements in the community interested in street and highway accident reduction.

Education

10. Education in safety and accident prevention should be incorporated in the curricula of elementary schools, both public and private, parochial schools, night schools, vocational schools, citizenship schools, and schools for non-English speaking adults, and should also be carried on through educational contests, organized playground training, schoolboy patrols, Boy and Girl Scouts, and junior safety organizations. More advanced training in safety and traffic matters should be developed in secondary schools, normal schools, schools for playground supervisors, engineering schools and universities, including training of traffic engineers.

11. A uniform manual should be compiled and distributed for the education of operators of motor vehicles in safe driving practices, divided into two sections, one comprising special instructions to drivers of commercial vehicles, and the other special instructions to drivers of private passenger automobiles; and standardized plans should be further developed and put into operation for the education in safe driving and accident prevention of the employees of steam and electric railways, employees of taxicab and motor-bus companies, and the drivers employed by operators of commercial vehicles.

12. Plans should be developed and put into operation for the education in safety of the general public through:

(a) Newspaper and magazine publicity—including the foreign language press
(b) Posters in public places
(c) Motion pictures and lantern slides
(d) Radio talks
(e) Schools for motorists, including both men and women
(f) Safe drivers clubs
(g) Safety programs or addresses at meetings of various organizations
(h) The churches
(i) Mass meetings
(j) Plans for reaching parents through school children
(k) Special campaigns

13. Standardized plans should be developed for the selection and training of traffic officers, and such plans should be put into operation by all communities, either alone or in cooperation with other communities or on a state-wide basis, so that the benefits of such training may be available to the smaller communities.

Statistics

14. To promote a better understanding of the traffic accident problem and the measures which should be taken for the elimination of accidents, accurate, complete and up-to-date statistical information should be secured by the duly authorized state (or, in large municipalities, by municipal) officials regarding all traffic accidents, with standard definitions of terms and reasonable uniformity in reporting and tabulating schedules, under the following headings:

(a) Location (place and position)
(b) Time (hour)
(c) Type of accident
(d) Weather
(e) Road conditions
(f) Lighting conditions (street)
(g) Physical condition of persons involved
(h) Experience of driver
(i) Age and sex of driver
(j) Relation of driver to car ownership
(k) Mental condition of driver
(l) What was the driver doing?
(m) Condition of car or cars at time of accident
(n) Speed of car or cars
(o) Primary cause of accident
(p) Contributing causes or circumstances of accident
(q) Violation of traffic ordinances or motor vehicle laws
(r) Age and sex of injured
(s) Extent and character of injuries
(t) Character and amount of property damages
(u) Preventive safeguards recommended

The information secured should be analyzed, and the summarized results published promptly and frequently. Accident spot maps should be maintained to detect those points at which accidents occur most frequently and to form the basis for plans to eliminate the conditions which cause accidents.

15. To promote popular understanding and attention to the accident problem and stimulate competition between various communities in accident reduction, a comparative index rating of all the states and communities should be set up through the Bureau of the Census with the cooperation of the organizations concerned.

16. A contest in accident reduction based on (a) the performance of each state or community for each year as compared with its previous record, (b) the adoption of measures recommended by this Conference for improvement of traffic control and enforcement, and (c) the provision of improved traffic facilities, is recommended to such organization or organizations as may be able to undertake such a contest.

Causes of Accidents

17. A comprehensive program of research into the causes of street and highway accidents should be undertaken by a national body qualified for the purpose, with the cooperation of other organizations interested, with a view to determining the direct and contributing causes of accidents and the frequency of the various hazards, and with a view to pointing the way to improvements from the standpoint of safety in design, construction, or adjustment of motor vehicles; design, construction, or maintenance of streets and highways; traffic laws, regulations, systems, signs and signals; and methods of examining applicants for operators' licenses, including special examinations for professional drivers, persons suffering from physical or mental handicap, and persons who may be brought before the courts or motor vehicle commissioners for repeated traffic violations.

Design and Maintenance of Motor Vehicles

18. Continued effort on the part of manufacturers is urged with a view to improving further the design and construction of motor vehicles and accessories from the safety standpoint, with particular reference to: proper road illumination without dangerous glare; construction and location of controls, accelerator, and brake pedals to minimize possibility of confusion or uncertainty of application by the driver; greater certainty, durability, and readiness of adjustment of brakes;

improvement of driver's vision; and other safety features.

19. A simple and practical inspection chart and code applicable to all makes of motor vehicles, giving particular attention to items affecting safety, should be prepared and issued through the Department of Commerce; and public authorities having supervision of motor vehicles carrying passengers and freight for hire should require adequate inspection and upkeep of such vehicles.

Street and Highway Traffic Facilities

20. A comprehensive traffic improvement program, including urgent immediate items and long-time items, should be undertaken in every community of metropolitan area confronted with a traffic problem. In the preparation of such a program, due consideration should be given to the relation of costs to benefits in safety and acceleration of traffic, and the program should be properly worked out and budgeted.

21. The traffic improvement program should be based on a thorough traffic survey, giving the necessary physical and traffic data and kept up to date, and due attention should be given to city and regional planning and zoning in their effect on traffic. The program should include:

(a) A transit plan, covering facilities for the mass movement of population by vehicles of all classes, including rapid transit, steam railroad commuter service, street-car lines, bus lines, private automobiles, and other means.

(b) A street and highway plan, providing for main thoroughfares, by-pass and interconnecting thoroughfares secondary streets, business and industrial streets, and local residence streets, with any necessary enlargements and improvments required to carry the traffic with expedition and safety.

(c) A traffic control plan, to provide for the orderly improvement of facilities and measures for the safe, efficient, and complete utilization of street and highway capacity.

A sound financial program should be established which will insure properly balanced progress in such improvements and will properly distribute the burden of providing the necessary funds.

22. To insure proper planning of traffic facilities and traffic control, to assure cooperation of the different departments of city or local governments concerned, and to enlist public support, a traffic planning organization should be created in each city or metropolitan area as follows:

(a) In each city there should be an official traffic commission, including such officials as the chief of police, city engineer, engineer of the city plan commission, chief of the city fire department, a representative of the public authority supervising city transit and transportation, a member of the city council, and a representative of the city's legal department. This commission should be a permanent body having the services of an engineering staff, preferably in charge of a trained traffic engineer, and should prepare a comprehensive traffic plan, make and keep up to date a traffic survey, and recommend a traffic ordinance and regulations, or recommend from time to time any necessary modifications in the existing ordinance and regulations.

(b) It will also be of value to have a traffic committee not made up of officials, but including representatives of street railway companies, motor-bus companies, taxi-cab companies, trucking organizations, chambers of commerce, automobile clubs and associations, safety councils, merchants' associations, and other interested groups. The traffic committee should serve in an advisory capacity to the traffic commission and assist in securing the interest and support of various representative organizations and the public generally. If there is no traffic commission, the traffic committee may temporarily carry out the functions of both bodies.

(c) In the improvement of main highways leading to and from large centers of population, it is frequently found that administrative jurisdiction over various sections of the road is divided among municipal, county, state, and even national authorities. In such cases practical results in relieving traffic congestion will usually be obtained most quickly by voluntary cooperation between the authorities concerned through the creation of joint boards to consider and determine policies of location, construction, maintenance, and use of the highways.

(d) To provide unified consideration and treatment of traffic problems in metropolitan areas which include more than one city, or a city and politically independent suburbs, it will generally be necessary to depend upon an enlargement of the unofficial traffic committee of the central city by adding proper representatives of important suburban communities, or in the case of two large cities in a single metropolitan area, to form a joint traffic committee with representatives of suburban communities added. When developments warrant, an official metropolitan authority should be created to control physical growth and provide for proper traffic facilities within large population centers.

23. In street and highway construction attention should be given to adequate roadway width with provisions for pedestrians, adequate rights of way to provide for parking space, for clear view at curves and intersections and for future roadway widening; space for parking off the traveled portion of rural highways, either continuously or at intervals not exceeding 300 feet; reasonable grades of not more than six per cent were feasible on thoroughfares of primary importance; curves of not less than 300 feet radius on highways of primary importance; curves widened and banked; no combination of heavy grades and sharp curves; adequate curb radii and smooth grades at street intersections; cross-sections of the pavement or roadway as flat as drainage conditions will permit; guard-railings of substantial type on the shoulder of embankments; clear view of approaching vehicles for at least 300 feet on highways of primary importance, with necessary control of private advertising signs on the right of way or upon private property near the highway; removing of trees, shrubs, and sloping banks on or off the right of way at curves and intersections, and cutting-down of sharp hill-crests; bridges at least 22 feet wide, to enable two lines of traffic to pass without difficulty, and suitable provision for the safety of pedestrians on such bridges; careful selection and clear marking of detours and maintenance thereof in safe condition; maintenance in good condition of pavements and roadway shoulders; prompt snow removal from streets and highways of heavy traffic; proper signs, signals, and highway surface markings on a uniform basis; and proper illumination of city streets and of state highways wherever financially practicable.

24. Adequate playgrounds throughout the community should be provided, and particularly there should be available a playground for every school as a safety measure to keep the children off the streets. Schools and playgrounds should, as far as practicable, be so located that children will not have to cross busy traffic streets in going to and from them. Adequate provision for skating and coasting, where practicable, should be made in parks and playgrounds, properly lighted and supervised, or on streets set apart, safely marked and traffic controlled, during hours used for these purposes.

Elimination and Protection of Grade Crossings

25. Elimination of grade crossings, either by relocation of highways or rail lines, or by grade

separation, which constitutes the only perfect solution of the problem, should be carried on under a proper program, first eliminating the most dangerous crossings on thoroughfares carrying heavy traffic, and with due recognition of the enormous costs involved, which, if elimination were attempted on a wholesale scale, would impose an excessive financial burden resting in the last analysis upon the public. The program should have due regard to the relative costs and advantages of grade-crossing elimination and other methods of protection, and should be given the most thorough joint consideration by proper authority. In laying out new highways or railroads, or relocating existing highways or railroads, grade crossings should be avoided or eliminated whenever feasible. In eliminating grade crossings, narrow or obstructed underpasses and sharp turns in the approaches thereto should be avoided. Authority to order grade separations or proper protection at grade crossings should be vested in the Commission having jurisdiction over the railways, and this Commission should also determine the proper division of costs between the railroads and the public. The state's highway department or other highway authorities should plan the improvement and initiate the proceedings for all highways under its jurisdiction. Time is an essential element, and a prompt decision should be provided for in the law.

26. Railroad crossings remaining at grade should be safeguarded in every reasonable way. Standard warning signs and pavement markings should be used to clearly mark the approaches to all public railroad crossings. Where the volume of traffic requires it, additional protection should be afforded by the use of flag men, gates, or approved electric or mechanical devices standardized as far as practicable. So far as possible, a clear view along the track in both directions from both sides thereof should be maintained. The placing of railroad cars near unprotected grade crossings so that the view is thereby obstructed, should be discouraged. Sharp curves, abrupt changes of grade, roughness in the pavement, or other conditions at or near the tracks which tend to divert the attention of the motorist, should be avoided. Properly designated state commissions should be empowered to designate dangerous grade crossings at which motorists must stop.

Suggestions for Further Action by the National Conference and State and Local Groups

In the development of the foregoing program it was necessary and appropriate that effort should be centralized through this Conference and its committees. Now, however, the problem remaining before the members of the Conference, that of putting the program into effect, is of a different character, and progress can best be made by cooperative effort of the various associations or groups represented in the Conference to secure the adoption of definite parts of the Conference program.

The major subjects in the foregoing outline of recommendations are as follows:

(a) Traffic laws and regulations
(b) Enforcement of laws and regulations
(c) Education
(d) Statistics
(e) Study of causes of accidents
(f) Design and maintenance of motor vehicles
(g) Street and highway traffic facilities
(h) Elimination and protection of grade crossings

For each of the headings in the foregoing outline of recommendations, an execution committee should be created to serve as a clearing-house for securing cooperation among the groups concerned in promoting the adoption of the Conference recommendations on that subject. Each such committee should include a member to represent each organization accepting responsibility with regard to the portion of the Conference program assigned to that committee. As promptly as possible after the conclusion of this Conference, each of these execution committees should meet and develop a detailed plan for carrying out its work through the several associations or groups represented.

A general committee on coordination of activities should be appointed by the Secretary of Commerce to coordinate the entire work. This general committee should be subject to call at such time as may in his discretion be desirable, and should determine whether and at what time any additional action may be necessary or desirable to further the purposes of the Conferences in improvement of traffic conditions and reduction of street and highway accidents.

As the improvement of street and highway traffic conditions and accident reduction is primarily a problem concerning the states and municipalities, state, regional, and local conferences will in many cases furnish a valuable means for working out the application of the National Conference recommendations to the conditions in various sections of the country. In communities where safety organizations already exist, such conferences should furnish the means for stimulating their work; and in cases where no safety organizations exist, the formation of such organizations, of a type appropriate to the size and condition of the community, should be a logical outcome of state, regional, or local conferences. Such conferences will afford opportunity for appropriate activity by the associations and groups undertaking to promote the adoption of various parts of the Conference program.

Safety Education by Motor Club

A CAMPAIGN of safety education is now being conducted by the Chicago Motor Club among the school children in northern Illinois and northern Indiana. Charles M. Hayes, President of the Chicago Motor Club, commends visual education and says:

"The Chicago Motor Club conceived the idea of issuing a safety poster once a month. Each month some traffic danger as it applies to children is depicted. These posters are placed in the classrooms of the public and parochial schools within the territory of the Chicago Motor Club in northern Illinois and northern Indiana. The poster is accompanied with a talk prepared by the Club dealing with the subject matter of the poster. These talks are used by the school teachers every Friday afternoon in a Safety First exhortation. The idea has become so popular that numerous clubs affiliated with the American Automobile Association are now using the Chicago Motor Club plan."

New Wacker Drive Supplants "Run-Down" Water-Front Street

By Hugh E. Young
Engineer, Chicago Plan Commission

THE former South Water Street, Chicago, home of the produce market for many years, is rapidly being replaced by Wacker Drive.

The old street was insanitary, and obstructive to the prosperity of the city. It was a burdensome charge on all the people, a drawback to Chicago's progress, and a conflagration danger to the whole Loop district. Eight years ago the Chicago Plan Commission pointed out that it could not remain as it was: a misfit destroying its own usefulness, damaging the entire city, congesting the streets, and seriously impairing the movement of traffic on all north-and-south streets entering the down-town district.

The new Wacker Drive will be a wide, two-level, marginal thoroughfare, extending nearly three-quarters of a mile along the south bank of the Chicago River from the south plaza of the now famous Michigan Avenue bridge to Lake Street, an important gateway to the west side.

As the Plan of Chicago progresses, it is proposed to extend Wacker Drive eastward along the south bank of the river to the shore of Lake Michigan, and southward from the western end of the present improvement, parallel with and a building's depth away from the east bank of the South Branch of the Chicago River to Archer Avenue and 22nd Street. These latter are two very important thoroughfares, one extending southwestward and the other westward to the city limits and beyond, and connecting with highways leading to the metropolitan district.

The new drive will become the northern boundary of the inner quadrangle and, by virtue of its geographical position, the keystone of the street system in the Chicago Plan. We must realize that Chicago is a city of three million inhabitants and covers an area of about 225 square miles of territory, which has developed in the form of a rectangle about 25 miles in length and 9 miles in width, its eastern side bordering the western shore of Lake Michigan from Calumet City on the south to Evanston on the north, and its western boundary extending along the Desplaines River in a north - and - south direction through 30,000 acres of beautiful forest preserves.

The inner quadrangle is approximately one square mile in extent, with Michigan Avenue near the shore of Lake Michigan forming its eastern boundary. Wacker Drive along the south bank of the Chicago River forms its northern boundary; and Canal Street, the important service street to the Union Station and the Chicago and North Western Railway ter-

Benefits of the Improvement

The two-level improvement of Wacker Drive is expected to produce these remarkable benefits for the city of Chicago:

1. **A $12,000,000 per year saving for the people.**
2. **Increased property values north, south, and west of the river, and throughout the central district.**
3. **Increased city revenue, resulting from increased property values.**
4. **The creation of two new streets—an upper and a lower thoroughfare in Wacker Drive—where there was practically none, because the former thoroughfare was entirely absorbed by private business.**
5. **Increased traffic facilities on north-and-south and east-and-west streets, through the removal of 16,000 market vehicle trips per day, and the elimination of the clogging of north-and-south thoroughfares by market vehicles.**
6. **The provision of an uninterrupted heavy-traffic connection on the lower level between the industrial district on the north side, the boat and freight terminals east of Michigan Avenue, and the west and southwest side warehouse, terminal, and industrial districts.**
7. **A 41 per cent reduction in Loop traffic, saving time and money for everybody.**
8. **The establishment of dock facilities, equipped with tunnel and freight station connections, for marine landing, barge, steamboat, warehouse, and storage purposes, thus making the Chicago River an object of use, beauty, and profit, instead of ugliness and loss. The Wacker Drive improvement is the first step in capitalizing the river-front.**

The Wacker Drive improvement was initiated by the Chicago Plan Commission in 1917. The necessary city ordinance was passed by the City Council in June, 1922. Construction work was started by the Board of Local Improvements October 1, 1924, and it is expected that Wacker Drive will be completed by the fall of 1926.

minal, bounds it to the west. Its southern boundary is Roosevelt Road, the great approach to the lake front from the west side, terminating at the Field Museum, the Stadium, and the proposed Illinois Central Railway terminal at the lake front.

Having in mind the location of this comparatively small but intensively developed commercial area, we must see it as one of a series of concentric quadrangles (within the city) and belt thoroughfares (in the region extending far beyond the city limits), circling from the shore of the lake on the north, westward, southward, and eastward again to the lake front on the south—comprising a system of thoroughfares destined to become major street improvements in the master plan of the Chicago region. Again, we must see the inner quadrangle, the clearing-yard of three million people, the focal point in the system of radial streets extending from the marginal streets of the inner quadrangle in all directions like the spokes of a wheel to the city limits and beyond, connecting with country highways extending to the outermost points of the regional district.

When the four streets forming the quadrangle have been improved, the heart of the central business district will be enclosed by a system of wide thoroughfares which will act not only as marginal distributors for the street system in the central business district, but will function as by-pass routes for through-bound traffic. Studies show that 25 per cent of the traffic entering the congested district is through-bound.

OLD SOUTH WATER STREET, CHICAGO
The buildings along the right-hand side of the street have been removed

The completion of the quadrangle will not only greatly relieve Loop congestion, but the removal of the South Water Street produce market to a more economical and better-adapted location in the vicinity of 16th Street and Morgan Street southwest of the Loop district, has taken 16,000 market vehicle trips per day off the Loop streets, thus freeing traffic movement on the north-and-south and east-and-west streets, and reducing the present congestion in the down-town district 16 per cent. This is in addition to the 25 per cent reduction in Loop traffic that will result from by-passing through-bound vehicles around the Loop—a total reduction of 41 per cent.

The Upper Level

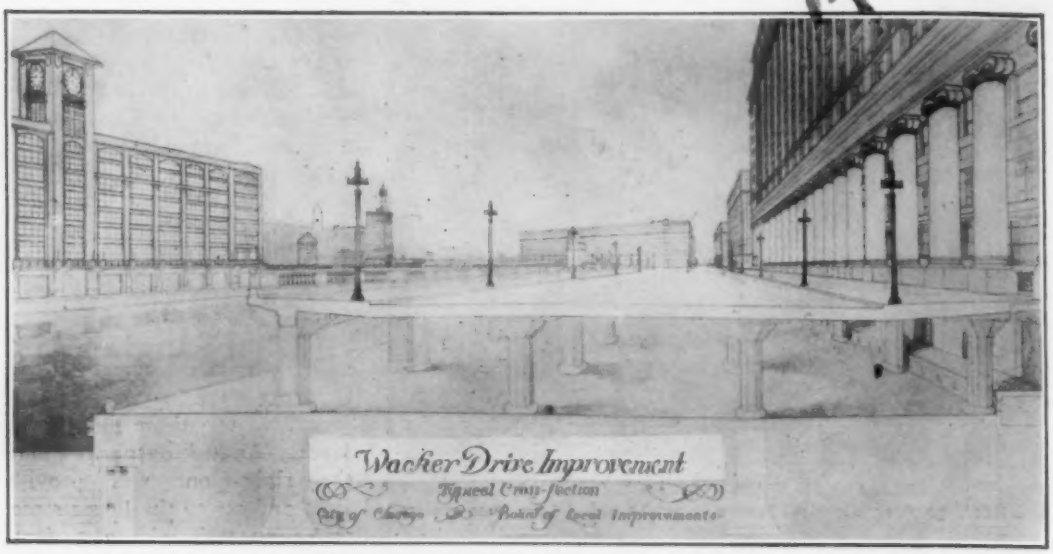
The upper street, extending from Michigan Avenue to Market Street, will be 110 feet wide, having a 72-foot-wide roadway with a 24-foot sidewalk on the south side of the street and an 18-foot-wide promenade running along the river on the north side. It will be approximately 20 feet above city datum, conforming to the new bridge approaches. The upper level will extend along South Water Street as well as along River Street (Wacker Drive) between Michigan and Wabash Avenues, and will be used for light traffic of all kinds.

All north-and-south streets will slope gently to the upper thoroughfare of Wacker Drive, just as Michigan Avenue does to-day, so the new improvement will appear to be a part of the regular street system. The fact that there are two thoroughfares will be noticeable only from the river side. The upper level will be carried on a reinforced concrete structure with a masonry wall along the river-front. Along the wall and bordering on the northern sidewalk will be a fine Bedford stone balustrade. Both the wall and the balustrade will receive an architectural treatment in harmony with the Michigan Avenue structure, particularly at the junction of these thoroughfares. Arched openings along the river-front will provide light and air to the lower street and connect it with a 20-foot-wide open dock which will extend the entire distance of the improvement. Artistic stairways at the bridge abutments will connect the two levels at every north-and-south street.

The Lower Level

The lower level is designed especially to provide heavy commercial traffic with a through street, uninterrupted by cross-traffic. It will be constructed at 5 feet above city datum, or at the present level of the docks along the river. The clearance between the upper and lower streets will be 12 feet and 4 inches. Ample connections between the lower and upper levels are provided not only at each end, but also at strategic points. The lower level will be provided with a six-line roadway for heavy traffic; and a continuous raised sidewalk along the south, to be used as loading platform

SECTION OF WACKER DRIVE BETWEEN WABASH AVENUE AND MICHIGAN AVENUE, UNDER CONSTRUCTION



CROSS-SECTION OF THE UPPER AND LOWER LEVELS OF WACKER DRIVE, FOR LIGHT AND HEAVY TRAFFIC, RESPECTIVELY

and ventilating duct. Freight, dock, storage, and other facilities are also provided.

Property Values Will Be Increased

When this improvement has been completed, surrounding property values throughout a large area north, south, and west, as well as in the central business district, will be increased in a manner similar to the increase resulting from the Michigan Avenue improvement, which amounted to over $100,000 000.

The improvement has materially increased the value of property not only fronting on the street itself, but also on side streets throughout a wide area. It has been estimated that the total increase in value of the property in the assessed district to-day will amount to more than six times the total cost of the improvement.

Cost to Benefited Property

The total estimated cost of the Wacker Drive improvement is $22,000,000, of which about 50 per cent is paid by the city as a public benefit, the remainder being assessed on the property benefited by the improvement. The

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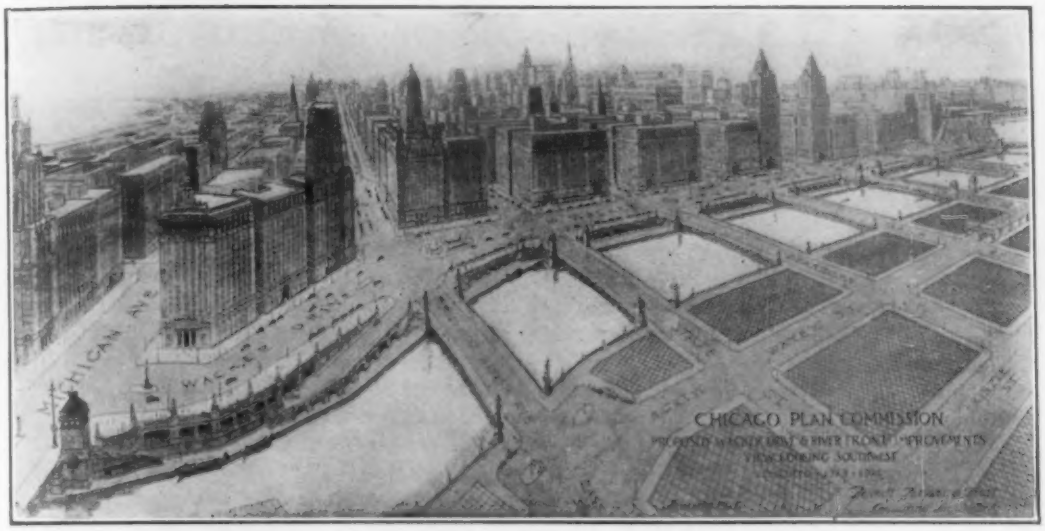
WACKER DRIVE RUNS ALONG THE SOUTH BANK OF THE CHICAGO RIVER
This view shows to what extent buildings have been removed in the improvement



WACKER DRIVE AND RIVER-FRONT IMPROVEMENTS, LOOKING SOUTHWEST

district assessed for this improvement is approximately 3 square miles in area, extending 1½ miles distant to the north, ½-mile to the lake on the east, 1½ miles on the south to Roosevelt Road, and ½-mile on the west. The property that fronts the improvement, naturally, pays the largest assessment, and the amount becomes smaller and smaller the farther away a piece of property is from the improvement. In view of the increased value of the property that will result, no undue burden will be caused by the special assessments, but, on the contrary, great benefits will result. The law provides ample safeguards to the property owner. No property owner can be made to pay one dollar more than the city can prove his property will be benefited. Every owner whose property is taken or damaged receives fair compensation.

By constructing the Wacker Drive improvement and other similar improvements in the Plan of Chicago, as well as terminal, harbor, and postal facilities so good that no other city can offer better,—thereby providing unequaled facilities for the easy, quick, and economic transaction of business,—the city of Chicago will maintain its present commercial leadership.

Bats, Mosquitoes, and Dollars

To the Editor of THE AMERICAN CITY:

Privation, perplexities, and difficulties which test the patience, endurance and fortitude are the lot of any man who attempts to solve the hidden processes of nature. Usually the few most determined men reach the goal of success. One such is Dr. Charles A. R. Campbell of San Antonio, Texas, a practicing physician and specialist on the diseases of malaria and typhoid fever, who has devoted 25 years of study and investigation in seeking a natural preventive of the infection introduced into the human blood from the bites of malarial mosquitoes. The preventive Dr. Campbell presents in detail in his book entitled "Bats, Mosquitoes and Dollars."* The findings of fact are:

First, that the common bat is the deadly enemy of the malarial mosquito.

Second, that the bat can be domiciled and reared in vast numbers.

Third, that the bat, when so housed and reared, will clean the most scourged malarial district of the mosquito and its attending afflictions upon humanity.

The enactment of the law by the Legislature of the state of Texas imposing a penalty for killing or injuring the common bat; the endorsement of the medical profession, and appreciative testimonials of the Surgeon General of the United States Army and from many foreign sources, all bear testimony to the practical success of Dr. Campbell's work. These accomplishments are an achievement in civil engineering as well as along hygienic lines in that they represent the directing of natural resources to, and a unique structural development for, a vitally useful purpose. It is an excellent book for health officials and sanitarians to read carefully.

Besides the particular subject alluded to, Dr. Campbell's book has an interesting discussion of the origin and eradication of smallpox, and of the functions of the spleen, and of the dragon fly, also an enemy of the mosquito. The results of Dr. Campbell's investigations and demonstrations have received high endorsement in this country and abroad, and should be widely circulated.

WYNKOOP KIERSTED,

* See department of Municipal and Civic Publications, in THE AMERICAN CITY for February, 1926, page 221.

Cost Analysis of Snow Removal in Michigan

By V. R. Burton

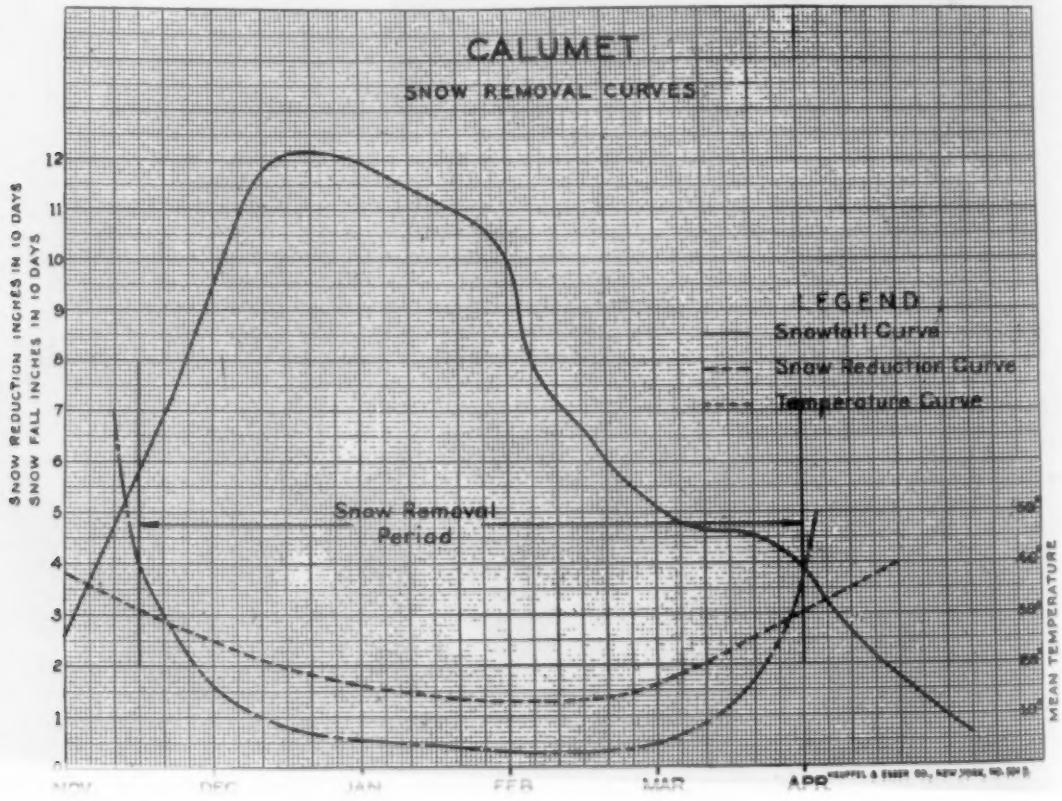
Engineer on Special Assignments, Michigan State Highway Department

IN order to understand why a snow-removal survey as complete as that undertaken by Michigan was desirable, some knowledge of the conditions influencing removal is necessary. Michigan, consisting of two peninsulas with water on three sides of each, lies between latitudes 41° 45′ N, about that of the northernmost tip of Maine to 47° 30′ N, which is about that of Providence, R. I. The airplane distance from Monroe in the southeast corner of the Lower Peninsula to Ironwood in the western corner of the Upper Peninsula, is about 475 miles, or about the same as from Monroe to St. Louis, Mo.; Chattanooga, Tenn.; Richmond, Va., and Philadelphia, Pa.

As can well be imagined, a state spread over a territory of this extent experiences a variation in temperature and snowfall seen in few others except where such variation is due to changes in altitude in mountainous territory. The temperature rarely goes below 5 or 10 degrees below zero in Monroe, while temperatures in the interior of the Upper Peninsula frequently reach 40 or 50 degrees below. At Monroe about a 30-inch snowfall is usual, whereas the Calumet average is 130.

Topography varies quite as widely. All variations of glacial topography occur, from the flat fertile clay beds of the ancient glacial lakes and the sandy barren outwash plains to rough and hilly moraines. In the western end of the Upper Peninsula, besides all variations of glacial topography, there are high, rocky hills, which in some states would be dignified by the title of mountains.

The southern two-thirds of the Lower Peninsula is largely agricultural and industrial with the major part of the state's industries grouped in the southeast quarter of this territory. The northern third of the Lower Peninsula consists largely of cut-over timber-land, some agricultural land, and a little timber. This territory



does now, and must for some time in the future, depend largely on its recreational features for its support. The eastern end of the Upper Peninsula is agricultural and timber-land. The western end is a mining and timber territory. In the mining territory along any particular range will be found small, highly industrialized regions with large stretches of wild land between.

Snow Removal Increasing Yearly

Snow removal is practiced on practically all of the state's trunk line roads in the lower half of the southern Peninsula, some removal is done in the south half of the northern half, and none in the northern half of the northern half of the Lower Peninsula. Wheeled traffic is maintained between certain mining towns in the western half of the Upper Peninsula.

That is, as briefly as possible, the situation as it exists to-day, but this situation is rapidly changing. We are confronted with an ever expanding snow-removal program. As the timber in the northern part of the state disappears, leaving the raw cut-over land in its wake, it is an economic impossibility for the branch line railroads to continue service. Line after line is being torn up, and the territory served by these branches is being left with no means of transport but the highway. Add to this the extension of hard-surfaced roads northward, largely for summer traffic, a growing population serving the needs of our summer visitors, and a developing agriculture, and it requires little imagination to predict the outcome. In a short time, motor traffic must and will be maintained over a large area not even considered at present.

Each year the Highway Department in Michigan is flooded with requests for more open roads, and it became an absolute necessity for us to be able to make some reasonable estimate of the cost of the work requested and the equipment required to perform it. The snow-removal program of 1924-25 included 2,571 miles, of 1925-26, 3,024 miles, and it is highly probable that 1926-27 will reach a total of about 3,500 miles.

The work added each year is in a territory in which conditions vary greatly and in which work has never before been done. There are therefore no cost records available for budget estimates in the territory to be considered for future removal. The only records which we have which could possibly be of value are the U. S. Weather Bureau records of temperature, snowfall, wind, etc., for the stations in the country involved.

Of the climatic factors affecting snow removal, temperature and snowfall are inseparably linked. It is quite evident that snow falling in the higher temperatures will not drift as badly as in lower temperatures. On the other hand, it must be equally plain that a foot of wet, soggy snow is more difficult to move than an equal amount of the light, crystalline material met at the lower temperatures. Again, snow falling at the higher temperatures may not drift enough so that removal of the smaller snowfalls is necessary at all.

AN INTERESTING ILLUSTRATION OF THE EFFECT OF SNOW-FENCES IN KEEPING SNOW OFF THE TRAVELED HIGHWAY

In an earlier article on snow removal, it was shown that by means of the amount of snow reduction in the 48 hours including and succeeding a storm, a fairly accurate estimate of the amount of snow actually moved and the length of the snow-removal period could be made. This of course refers to the average condition over a long period of years, as only those station reports of ten years and longer were used in the computation of these averages.

This method of estimating the length of the snow-removal period is shown in the accompanying diagram for Calumet. The abscissae are 10-day periods in 30-day months, and the ordinates are platted for each 10-day period. The difference between the ordinates of the snowfall and snow reduction curve gives the amount of snow remaining on the ground for 48 hours for each 10-day period. It is assumed that this snow is what is actually moved during the removal period. The period is shown to begin on November 15, and end on April 1. This corresponds very closely to observed facts.

This method is applicable over the entire state for snow falling unaffected by the wind, and it is therefore possible to compare on this basis widely different sections by the number of inches of snow per mile to be moved. If, now, we compare unit cost of inch-mile snow removal, using in our comparison the various factors which produce cost variations over quiet snowfall, we can assign varying unit

costs to take into account these different factors. To get a truly accurate idea of these varying unit costs, cost records for a number of years sufficient to insure comparison for average climatic conditions should be had.

The territory served and methods used have been changing so rapidly in this state that the only dependable cost record which we have is for the winter of 1924-25. Unfortunately that year in Michigan was an unusual year characterized by January and February temperatures from 2 to 6 degrees below normal and a snowfall from 12 to 60 inches below normal. It is therefore admitted that the accompanying cost analysis should be looked on with considerable suspicion if it is intended to be used as a basis for future prediction. As has been intimated before, the application of any one year's costs to the average is a dangerous procedure, anyway. Our excuse must be that it is all we have.

In considering conditions for a single year, the method outlined for the average is inapplicable. Each storm must be considered in applying the reduction, and the snow removed determined by the actual performance of the maintenance forces. The mean temperatures, in order to be comparable, however, should be determined by the more theoretical considerations of when the removal period should have begun and ended.

The factors considered in the accompanying table of cost analysis were, first, temperature; second, wind direction; and, third, topography. That the cost per inch-mile of snow removal varies also with the snowfall is true, but enough cases were not available to bring out this variation in detail except as shown in the table. These figures are derived from a cost computation over the entire 1924-25 winter system.

Each trunk-line road across an entire country was considered a unit in most cases, and the average removable snow, temperature, wind direction, and topography applied to this road. Trunk-line lengths across Michigan counties will average about 25 miles. There will be large variations from the average of the factors considered in even this short distance in the Upper Peninsula, and therefore in some Upper Peninsula counties the distance was reduced.

The cost per mile for each trunk-line road in the country was computed from the cost records of the individual maintenance sections. The cost of snow-fence is assumed to be a 20 per cent depreciation charge plus the labor of erection and dismantling. There is unquestionably a great difference in the efficiency of the organizations doing this work, which is reflected in cost, but the more glaring examples which were known to us have been eliminated and the others compensated for in the second part of the table.

The amount of removable snow was determined by snowfall records, temperature rec-

ANALYSIS OF SNOW-REMOVAL COSTS WINTER 1924-1925

Number of Counties Studied	Mean Temperature During Removal Period	Inches Removable Snow Variation		TOPOGRAPHY: FLAT — Direction of Wind			GENTLY ROLLING — Direction of Wind			ROLLING — Direction of Wind			HILLY — Direction of Wind		
				‖ to ↕	↕	↕ to x	‖ to ↕	↕	↕ to x	‖ to ↕	↕	↕ to x	‖ to ↕	↕	↕ to x
			ACTUAL SCHEDULE OF UNIT COSTS												
8	Below 18°	30–80	Average Inch-mile cost	1.45										3.20	
			% of ↕ wind	100										100	
			No. cases	2										10	
11	18°–20°	7–20	Average Inch-mile cost	1.74	1.92	2.61	1.60	1.85	2.86	1.66	2.29	2.13			
			% of ↕ wind	91	100	136	87	100	155	73	100	93			
			No. cases	1	4	4	3	5	5	1	4	4			
17	20°–22°	7–20	Average Inch-mile cost	1.25	1.33	2.28	0.69	0.56	0.81	0.57	0.97				
			% of ↕ wind	94	100	171	100	100	81	70	100	120			
			No. cases	5	5	2	5	7	1	4	4	6			
8	22°–25°	5–30	Average Inch-mile cost	2.81	3.93	4.32		2.48	2.97	2.54	2.00	2.79			
			% of ↕ wind	72	100	110		100	112	127	100	140			
			No. cases	2	2	3		4	1	1	4	1			
			POSSIBLE SCHEDULE OF UNIT COSTS												
8	Below 18°	30–80	Average Inch-mile cost		2.00									3.50	
			% of ↕ wind		100									100	
11	18°–20°	7–20	Average Inch-mile cost	1.70	1.90	2.65	1.70	1.90	2.65	1.70	2.10	2.50			
			% of ↕ wind	90	100	140	90	100	140	80	100	120			
17	20°–22°	7–20	Average Inch-mile cost	1.25	1.40	2.00	0.60	0.75	0.90	0.65	0.80	0.95			
			% of ↕ wind	90	100	140	80	100	120	80	100	120			
8	22°–25°	5–30	Average Inch-mile cost	2.70	3.00	4.20	2.00	2.50	3.00	1.00	2.00	2.80			
			% of ↕ wind	90	100	140	80	100	120	90	100	140			

ords, and the dates on which our records show plows to have been used. The reduction secured from the reduction curve showed only from 1 to 6 inch reduction during the removal period, but snow which fell before and after plows were used varied from 1 to 30 inches, in a total annual snowfall of from 25 to 60 inches.

From the amount of removable snow and the cost per mile, the inch-mile costs were made up. These costs were grouped into four temperature ranges: first, those which occur in sections which had a mean temperature during the removal period of less than 18°. This includes all but one Upper Peninsula County. The second classification was from 18° to 20°; third, from 20° to 22°; and fourth, from 22° to 25°.

Topography is classified as: flat, which includes the glacier lake beds and outwash plains; gently rolling, the till plains; rolling, the moraines; and hilly, the heavy moraines and rocky outcrops. This classification is admittedly vague and over as long a stretch as 25 miles subject to considerable variation. The predominating classification is used, however, and is in most cases sufficiently accurate when dealing with so many large variables.

Culture has not been considered as important as it should be, but in those counties from 20° to 25° included in the cost analysis the flat and gently rolling land is largely cultivated land. There is a larger proportion of wooded land in the rolling land. In the counties below 18° the county is generally more wooded, especially the two flat stretches noted. Conditions among counties in the same temperature classification are in general quite similar.

Wind direction is given as quartering, parallel to quartering, and quartering to cross, assuming thirty-degree divisions of the quadrants for this classification. This information was secured from Weather Bureau reports of prevailing wind direction during the snow removal period.

Two tables are shown in the cost analysis: first, the actual schedule of average unit costs; and, second, a table of possible unit costs weighted both according to the number of cases to be had and from personal knowledge of the class of work done in each case. This weighting was done to give a more consistent arrangement of percentage variations. It will be seen on comparison with the actual costs that this rearrangement has been done without too serious mishandling of the actual costs.

In discussing this cost analysis, it should first be stated that except for the range of snowfall shown as below 18° there seemed to be little or no relation between the amount of snowfall and inch-mile costs over the range covered; that is, in a number of cases it cost just as much per inch to move 30 inches as it did to move 5. Above the 30 inches and with temperatures below 18°, however, there is an apparent increase in cost as the amount increases. Because in some cases the class of service was not comparable, for the present at least, only the averages will be used.

We should naturally expect that the inch-mile cost should increase with the snowfall, and if the costs of the next higher temperature classification are compared, this is found to be the case. This is for two reasons: first, there begins to be at about a 30-inch amount of removable snow, a much more general use of tractor plows, and these are more expensive units to operate than the trucks used for smaller amounts; second, as the winter goes on, the accumulation of snow at the side is a more serious means of increasing the cost in the higher snowfalls, from the additional drifting caused by it and the increased difficulty of getting the snow back.

It might be assumed that the total cost of removal would vary more consistently with the number of trips made rather than with the total amount of snow moved during the season. This did not prove to be the case even though in some instances the number of trips exceeded the number of storms by 100 per cent. If the number of hours spent on the trip were taken into account, they would of course be a direct index of the cost, but because of variations in the time of trips, the number of trips gives little information as to relative costs. The time consumed is in general proportional to the amount of snow moved, when this time and snow moved are averaged over the whole season.

While there was some overlapping of unit costs by sections near the limits of the temperature divisions chosen, the general run of individual costs was quite consistent, really surprisingly so in the case of the 20° to 22° division. There are of course always bound to be inconsistencies due to the class of service rendered, efficiency of the organization operating, amount of traffic on the road, use or nonuse of snow-fence, etc., even if all our other factors were mathematically exact, which they are far from being.

The most remarkable variation in cost per inch-mile is shown by the classification according to temperature. It should be remembered that this cost variation is due to the product of two factors—first, the depth of drifting, and, second, the cost of removing the particular

class of snow encountered through that depth. It can easily be seen that there may be a temperature at which a minimum cost may occur due to the minimum product and not the minimum of either factor.

Throughout all ranges of topography and wind conditions the costs per inch-mile from seventeen different counties with a mean daily temperature of 20° to 22° are consistently less than for temperatures either above or below this temperature range. Drifting is not so serious at this temperature as it is at the lower temperatures, and the cost of moving an inch of drifted snow is not so high as it is in the temperatures above. We have here, then, the condition of snow removal at the minimum cost per inch-mile.

As the temperature drops below 20°, the amount of drifting increases faster than the decreased cost of moving a lighter snow, and we get increased costs. The inconsistency noted in the actual schedule of the table for the flat topography below 18°, is explained by a difference in culture. The two instances studied are from Upper Peninsula counties where the land is much more wooded and hence protected from drifting.

As the temperature goes above 22°, the snow gets heavier and more difficult to move, since thaws are much more frequent. The cost of moving this kind of snow increases faster than the decreased amount of drifting. This may seem like a rather far-fetched explanation to account for these cost variations, and if the roads could be kept continually clear without any interruption of service it is doubtful if so marked a difference in cost would be shown. To permit a road to fill up and then remove the packed snow after it has frozen and thawed for a day or two, is a certain means of increasing costs. Increased speed of removal in these regions of higher temperature will unquestionably lower the averages given.

In one county, Monroe, with a temperature average of 25.7° and a 10- to 12-inch amount of removable snow, there was some indication that the decreased amount of drifting had lowered the unit cost in spite of the increased weight of the snow but not enough data were at hand to draw any definite conclusion.

Effect of Topography on Cost

Let us now examine the effect of the difference in topography on the inch-mile cost of snow removal. It will be noticed that with the 22° to 25° temperature range with a 5- to 30-inch variation in removable snow, the cost decreases fairly uniformly from flat to rolling country. In our adjusted table this varies, using the quartering wind as a standard, from two to three dollars per inch.

In the flat country included in those counties from which the data on temperature range from 18° to 25° were derived, as has been stated, a majority is cultivated land. On a terrain of this character the wind gets a long, clear sweep across the fields, picking up the snow as it travels along the surface, and deposits it at the first obstruction to its progress. This obstruction need not be any more serious than a woven-wire fence, especially if weeds and brush are allowed to stand along the fence row. Tighter obstacles, such as picket or board fences, of course increase the amount of drifting. The various rights of way of from 50 to 66 feet do not give sufficient clearance between road and fence, and the drift forms in the roadway.

Drifts in this sort of country are characterized by only medium but very uniform depths extending for long distances along the road. There are no appreciable side slopes to absorb any of the snow accumulation or break up the sweep of the wind, and the top slope of the drift is therefore very flat throughout most of its length. These long, comparatively shallow drifts are removed, and the ridge accumulation along the side aggravates further drifting until, before the winter is over, surprisingly large amounts are on the ground.

The factors which tend to reduce the cost through this temperature and snowfall range over the more rolling country are several. First, as has been stated, especially in that part classified as rolling, more wooded land is seen. Second, where the snowfall range is no higher than it is and with temperatures this high, the storage capacity of the side slopes of the larger cuts is not so often exceeded, and less snow drifts in the roadway. Finally, long stretches of roadway on fills will be swept bare of snow. As we pass from flat through gently rolling country to rolling, there are of course all sorts of variations of these factors.

On examining the next lower temperature class, from 20° to 22°, the importance of the flat topography is still evident, although the cost is reduced. The gently rolling country shows the minimum cost, although between rolling and gently rolling not much difference is seen. The importance of the larger drifts in rolling country begins to be evident, with the increased drifting caused by the drop in temperature. The increased amount, however, does not yet overbalance the decreased cost of the lighter snow.

When the temperature drops to from 18° to 20°, the increased drifting materially raises

the unit costs. The larger drifts cause much more trouble, and it is now more a question of depths of snow than of quality. As we should expect, little difference is seen between flat and gently rolling country. The heavier cuts in the rolling country are now of somewhat more importance in their reflection of inch-mile cost.

When we get into the Upper Peninsula, the cuts in the rolling and hilly country are of much more relative importance and cause a serious increase in cost. These extremely bad cuts and the heavy drifts which form in them not only influence the cost from their depth alone, but because of the rapidity with which they fill, will not permit of the continuous method of removal so essential to low costs.

Summing up the discussion of the effect of topography on snow-removal cost, we see that from a certain temperature of minimum inch-mile cost, the cost increases with the roughness of the topography as the temperature falls, and decreases with the roughness as it rises.

Effect of Wind Direction

As was shown in a preliminary study of the Michigan snow problem, the matter of wind velocity for a range in value no greater than those shown in our state is unimportant when studying a full season's work. The prevailing wind direction, however, has been found to be a more considerable factor than was at first supposed when applied to locations of similar snowfall and temperature. There are more inconsistencies, naturally, in a study of so variable a quantity, because a few storms which do not come from the direction of the prevailing wind may cause trouble on a section that is comparatively drift-free when normal winds are blowing. In general, though, where the larger number of cases are compared, cost variations are fairly consistent, at least so far as sign is concerned.

The reason that the amount of snow drifting into the road varies with the direction of the wind is perfectly obvious, yet it may be well to state it. There is no less snow moving along the surface in a parallel wind than in a cross-wind, but the axis of the drift is parallel to the direction of the wind. The inclination of the wind's direction to the center line of the road then largely determines whether or not a drift of given length will reach to the roadway. By length we mean, of course, its direction parallel to the wind.

The quartering wind is adopted as a standard of comparison, as it is much more frequently met in our state, where the prevailing winter winds are largely Northwest and Southwest, quartering our section line roads. About all that we can safely say at present about these variations is that with the quartering wind as a standard it costs from 10 to 20 per cent less on those roads whose prevailing wind direction is from parallel to quartering, and 20 to 40 per cent more on those roads where this direction is from a quartering to cross-wind.

This completes our cost analysis, and I wish to emphasize again the fact that these figures shown as possible costs are tentative. They are the only ones we have which are at all reliable, but are certain to be modified as our range of snowfall studied is increased and a sufficient number of years' records is available to bring the costs to a closer approximation to the mean. It is felt, however, that the method of comparison outlined may prove of value to those whose situation is somewhat similar to our own. It is a logical method and so far as is known is the first of its kind attempted.

COMBINATION OF ROTARY AND PULLED PLOW FOR CLEARING FULL WIDTH OF ROADWAY IN ONE TRIP

The periscope of galvanized iron is used by the driver to see through the snow cloud from the rotors

How Study Is Being Used

Interesting, if true, but now that we have it, what are we going to do with it? We believe first that it is an impossibility to intelligently select equipment without a knowledge of the average and maximum amount of removable snow which may have to be handled with it. Secondly, the cost of operating such equipment must be reducible to a common basis if we are to judge wisely in our choice of methods of removal in the future.

Only a very brief and general discussion will be given of this phase of the subject, because we do not feel that we have as yet com-

plete enough data or long enough experience with the more modern type of equipment to be too specific. This is especially true for snowfalls from 60 inches total annual upward. A few general principles, however, may be stated.

In the first place, so far as is consistent with economy of operation, equipment with the possibility of year-round use should be chosen. This means, then, that the plow which is used exclusively for snow work should be as low in price as possible and its motive power usable for other service. The depreciation charge applied through a daily rental figure is enormously high on plows because of their infrequent use.

The frequency with which plows, both light and heavy, were used during the winter of 1924-25, for the various classes, is shown in the following table:

DAYS ON WHICH PLOWS WERE USED—WINTER 1924-1925

Temperature Class	Total Amount Snowfall in Inches			Days Light Plows Used			Days Heavy Plows Used		
	Max	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
Below 18°, 1 County	..	..	100	..	..	..	..	..	34
Below 18°	91	39	62	..	..	..	16	7	13
18°-20°	49	22	34	23	8	17	6	0	2
20°-22°	41	21	26	18	4	9	Only two Counties, 1 in one, 2 in other		
22°-25°	55	26	44	28	9	19	4	0	2

It can readily be seen from the above that except for their "snow-removal insurance value" heavy plows are an expensive luxury.

Next, if continuous service is to be given, the plow power units must be as fast in operation as possible. The cardinal principle in successful and economical snow removal is to start operations as soon as sufficient snow has accumulated in a storm and keep going until the storm is over. This means the more general use of comparatively fast trucks and light blade plows, made possible in the heavier snow districts by a generous use of drift-preventive measures and the removal method to be outlined later.

The larger number of our storms all over the state are small ones. Nearly 90 per cent of storms in all ranges of snowfall occur in amounts less than 6 inches in twenty-four hours. From 60 to 75 per cent, is less than 3 inches in twenty-four hours. The use of drift-prevention and control measures is obvious.

Value of Different Equipment

The function of the truck plow is not to move the snow back except early in the season, or if snowfalls are light and in the early stages of a storm. The main function of the truck plow is to keep traffic going, and its efforts should be confined to the center of the roadway. If this be the case, then the blade is certainly the type to use, because the width cleared in a round-trip is the important thing. Enough units should be used so that drifts will not have time to form beyond its working depth.

While the "V" plow on a truck will handle greater depths of snow, it takes a greater number of trips to clear the same width. If we are comparing 10-foot truck blades and an 8-foot "V" plow, we see that the 10-foot blade can clear 16 feet of road in one round-trip (allowing no overlap), while in a round-trip with a "V" plow only 12 feet can be cleared. If we desire the 16-foot width with the "V," another trip out from the starting point is necessary and, unless a circuit is made, a dead run back. It therefore requires twice as many trips to clear the same width roadway as the blade. We can therefore afford to use twice as many blades as "V's" if by so doing the snow does not accumulate faster than the blades can handle it.

Snow left by the blade plows running in the center should be thrown back by other and heavier-duty units. These units may run through all variations of snowfall, from power graders, heavy truck, or tractor-drawn graders to the heavy "V" wing plow with 10-ton tractor, and finally the rotary. Through the lower ranges of snowfall and higher temperature, this moving back may not be necessary until the storm is over, but in the colder regions of heavy snowfall the two operations may have to overlap.

Too much attention has been given to the use of heavy tractor plows for sole use in snow removal. This has been largely due to the fact that the cost ratio of the operation of the two units has been overlooked. In ordinary snow work a 10-ton tractor will make 2½ miles per hour, at a cost of about $5 per hour. A 2½-ton truck equipped with pneumatic tires (and this we feel is the proper size for most work) will make about 10 miles per hour at a cost of $3 per hour. The usual clearing width of heavy "V" or lateral rotary plow used with the 10-ton tractor is 12 feet and the truck blade 8 feet.

Let us determine the cost ratio of operation of the two vehicles. In clearing a 24-foot road, the tractor plow first makes a center cut of

12 feet and then two side cuts of 6 feet each. This is theoretical width and does not allow for the necessary overlap. The plow is now at the wrong end of the road, and a dead run back must be made on which the speed can rise to 4½ miles per hour. We can eliminate the center cut and the return run by the use of trucks, and in addition clear a greater width of from 2 to 4 feet.

The speed of the center cutting is 2½ miles per hour, and the return run 4½ miles, so that the average speed of this round is 3½ miles per hour. At $5 per hour, this gives a cost per mile of $1.43 for the center cut. The trucks can operate at 10 miles per hour, at a cost of $3 per hour, or a cost of 30 cents per mile. Dividing $1.43 by $.30 we have 4.6, which is the cost ratio per mile of road run over.

This cost ratio means that if the time of clearing the center cut and making the return run with the tractor is equal to the duration of the time it would be necessary to use trucks for continuous clearing during a storm, we could use four trucks to one tractor in keeping the road clear at 15 per cent less cost. If the time of truck operation is twice the time of tractor use on center, we could use two trucks to one tractor with the same saving in cost, or we could use one truck for 4.6 times the time at equal cost.

This method of using trucks for the center clearing is possible under any conditions of snowfall, providing only enough units are used to keep the depth down and the side ridges back. Whether or not it would be economical in the extremely heavy snowfalls is another question which can be decided only by actual trial. In snowfall up to 60 inches in the Lower Peninsula we are sure that it is. The class of service rendered is not at all comparable, as the use of the light, fast-moving vehicle with adequate drift prevention is the only means of securing continuous service from the highway.

In closing, let me call attention to the new factor in the economics of the snow-removal question. The adoption of the gasoline tax has provided a source of public revenue for highway purposes which is a direct measure of road use. If the roads are blocked with snow, this revenue is not forthcoming. Our gasoline tax has not been in operation over a full winter as yet, but before the next season we can tell very closely from our gas tax receipts where the snow removal is paid for and how much it is reduced in places where it is not fully paid for. The net cost of snow removal is quite a different amount from its dead cost before the adoption of the gas tax. This factor more than any other will tend to extend winter maintenance to sections never before considered.

In our state at least our snow-removal problem has had only a fair beginning. Where the side roads are blocked, as they probably always will be in some places, a community garage for the storage of the owner's car on the main road and the extension of bus line and truck service will mean that the necessity for maintaining sleigh traffic on main roads will gradually disappear. It is a broad problem and one well deserving of the careful study of every state where the necessity of this class of maintenance exists.

ACKNOWLEDGMENT.—From a paper read before the American Road Builders' Association, at Chicago.

Arbor Day as an Occasion to Beautify Play Fields

THE celebration of Arbor Day will be given fresh interest in many states this year because of the national playground beautification contest which is being conducted by the Playground and Recreation Association of America. Recreation departments, playground committees, schools, park commissions, American Legion posts, parent teacher associations, women's clubs, chambers of commerce, and other organizations in 179 cities which have entered the contest and which are beautifying their playgrounds in anticipation of winning national honor and cash prizes of either $100 or $550 are being asked by the contest committee to utilize Arbor Day as one of the most appropriate occasions for the beautification of their play fields.

With the current interest in improvement of play spaces, it is expected that many cities not competing in the contest will also select Arbor Day for the planting of trees, shrubs, vines, and flowers about the school grounds and on play and athletic fields as a part of the general beautification movement.

On Arbor Day the special interest of the children will be enlisted by summoning them to do the planting or to engage in other beautification under the direction of a nurseryman or landscape architect. A ceremony, including a brief address on the meaning of Arbor Day, the reciting of verses, songs, and stories on noted trees, and the dedication of the plantings may accompany the planting.

Arbor Day is celebrated at different times in different states, but the majority of the states have selected days in April or May.

The Value of Comprehensive Plans for Sewer Systems

By A. Lawrie Kurtz

Assistant Engineer, Sewerage Commission of Milwaukee

THE engineering force of the Sewerage Commission of Milwaukee has among its duties the planning and construction of a sewage intercepting system for a large area comprised of thirteen different political subdivisions ranging from densely populated cities to towns composed for the most part of farm land. Ten years ago, eight of these subdivisions owned and operated sewage collection systems, which were gradually extended in the succeeding years.

About three years ago, a distinct change in the usual growth of the various communities took place. Instead of a gradual radial growth out from the established population centers, numerous new centers were formed, scattered throughout the area, apparently for no other reason than a good real estate agent and a fine view. The fact is, that the old centers were surrounded with undesirable property which had dammed their correct growth, and when once the breach was made, the entire structure failed and pioneering became the style.

The demand and necessity for sewerage, water, gas and electricity immediately became acute, and the value of comprehensive system plans, as far as sewers were concerned, was realized. The value of a system plan seems so self-evident that one wonders why it is necessary to discuss the question.

Plans Must Precede Construction

None of us would recommend the construction of the foundations for a building until at least tentative plans had been made for the building itself, yet this is the condition found in most communities.

This, I believe, is due mostly to ignorance as to the questions involved that can and should be shown on a system plan. For this reason I am going to enumerate the items which we have found are necessary for a comprehensive plan:

1. The limit of the district must be clearly shown and methods of serving adjacent territory indicated.
2. All present and future streets throughout the entire area must be shown.
3. The district must be zoned as to future use; that is, industrial, commercial and residential area must be indicated.
4. Probable street grades must be shown.
5. Sewers must be shown in all streets, together with the necessary manholes.
6. The size of all sewers and their elevations at all street intersections, and changes in grades must be shown.

Each item named has a distinct value, not only to the community, but to the designer, and poor judgment in fixing any of them affects the value of the whole.

The limit of the district must necessarily be known, and indicated upon all system plans. The joker in the Milwaukee specification, however, is the last phrase, "and methods of serving adjacent territory indicated." This insures against a haphazard fixing of the limit of a district and against finding in the future that the sewers already constructed must carry a greater load than that for which they were designed.

The location of all streets may seem to be unimportant, and there are many local areas in every system where it would not be necessary to have the street system entirely complete. Yet, in order to fix the location of necessary future streets, the entire street system must be studied; and as a system plan is a record of the designer's assumptions, they should be shown and are of value in locating manholes and changes in grade, especially in storm or combined sewer systems.

City Planning and Zoning Important

Many communities, realizing the value of city planning, have found it advisable to study the future street system and control platting so as to conform to a definite plan. A valuable sewer system plan will conform to such a study and in some cases will control the location of streets for the best interests of the community. In the matter of zoning the district, the designer must again call upon the city planning body or, if there is none, perform this part of its duties, for the requirements of sewers as to capacity and depth in each zone are different.

Probable street grades, intelligently fixed, are most necessary, especially where the district has very little slope. Many times the grade is governed by the sewer system. Every engineer realizes the cost and unpleasantness incident to changing a grade after it has once been fixed.

Sewer Plan a Guide

The routing and size of the sewers as shown on a system plan furnish accurate data from which the cost of sewering any part of a large district may be computed. It forms the basis upon which the government of a community may judge the feasibility of any petition for sewer facilities, and will, in a large measure, shape any sewer construction program so that the most value will be received from the money spent. It shows streets that must be opened and the property directly benefited by such opening.

The elevations at the street intersections, with the size of the sewers, are the result and aim of the designer's study. They allow the gradual construction of the sewers in a district, with the assurance that the portions first built will adequately serve throughout their life, and make it possible for construction plans to be prepared in a minimum of time and expense.

Conflict Between Sewers and Mains

Sewers, unlike water-mains, must always run down hill, and their grade cannot be greatly changed, yet water-main construction, especially the larger sizes, often precedes sewer construction, with the result that there is continual interference between the two, one or the other having to give way by resorting to freak construction.

This is true also of gas-mains, conduits, and other public utilities, and will not occur where a sewer system plan is on record.

Political Boundaries Useless

The system plans we found when we started our study of the area for the most part were deficient in the matter of area covered. The limits of the districts were the political boundaries at the time the plan was made, no provision being made for future annexations or for territory in the same drainage basin that would eventually have to be served. The result is that the systems, where the matter of elevation does not preclude it, are being extended and relief sewers are being built at great expense.

In some cases these system plans had been so poorly designed that it was found impossible to carry them out and they were abandoned shortly after being made. Needless to say, these communities do not think very highly of such plans, and the heterogeneous growth of the system without a definite comprehensive plan, with the consequent poor operation and high cost of maintenance, is considered one of the features of a sewer system.

The work of designing and constructing an intercepting sewer system draining a large area comprised of many districts, has been especially aided where the various communities have, at the same time, prepared local system plans. It has been possible to fix the location of the main sewers and make provision for connections so that the contributing systems can be built at a minimum of cost.

Milwaukee Provides for Metropolitan Area

At present the Milwaukee system has been designed and constructed to drain all districts now sewered; provision has been made, however, for the entire metropolitan area. The construction program from now on will consist of extensions into territory which the various governing bodies desire to develop, and at the request of these bodies. A request for an extension, however, has little weight unless the communities show their desire to make a proper use of the sewer by preparing comprehensive plans for the contributing systems.

Determining Constants for Flow in Sewers

In designing a system, an engineer must use his best judgment in determining the expected run-off from each class of service and constants which embrace each class of service to be provided for in both large and small municipalities must be determined.

These constants, in the main, were secured from a study of gage records of sewers in operation, draining an area which has a fully metered public water service, and are therefore of considerable value.

The total flow of sewage was assumed to originate from the following sources: domestic, commercial, industrial, ground water, and storm water. The constants in all cases except the first, are based on area, the first being based on population.

Domestic sewage is considered as all household wastes produced by ordinary dwellings, apartment houses, and miscellaneous establishments lying in residential areas. This was

assumed to be equal to the water consumption. From water department records and census figures, this was found to be 31 gallons per capita per day in 1913.

From sewer gagings, the average maximum rate was fixed as 81 gallons per capita per day. Due allowance was then made for the increasing use of water, the excessive use of water in apartment house districts, and Monday peak flows, the result of which fixed the average flow as 50 gallons, and the maximum rate 125 gallons per capita per day.

Commercial sewage is considered as consisting of wastes from office buildings, hotels, restaurants, and retail stores.

This unit of run-off was based on the water consumption in several representative blocks of this area, of which a detailed study was made as to consumption per 1,000 square feet of floor area. In order to obtain maximum rates, all meters were read at short intervals over two full days. From this, the 1913 average and maximum rates per acre were fixed and checked by sewer gagings. Allowance was then made for probable increase in floor area per acre of ground, and the run-off rate determined as 9,650 gallons average and 20,000 gallons maximum per acre per day.

Industrial sewage is considered as being the wastes produced by manufacturing plants, machine shops, foundries, breweries, tanneries, etc., and includes both the waste from the manufacturing process as well as the sanitary sewage. It will be realized that the actual flow from these various industries will vary greatly, and for this reason, detailed studies were made, first, of small areas containing high water-using industries, and gradually increasing these areas until all representative industries were included.

These studies were based on public as well as private water-supplies, and produced a curve showing high unit rates for small areas and small unit rates for large areas. In other words, provision in small industrial areas must be made for the high water users, but as the area increases in size, the possibility of high water users over the entire area decreases.

A curve of run-off was plotted from the following data:

Acres	Cu. Ft. Per Second Per Acre
0 to 5	0.75
8	0.50
10	0.40
13.5	0.30
20	0.22
30	0.15
50	0.10
150	0.055
250	0.04
1,000	0.03

Ground water is the infiltration or leakage of water from the surrounding ground into the sewers. There are so many variables affecting this amount, that one guess is about as good as another. The quantity depends on the amount of water in the surrounding ground, the care taken in the construction not only of the sewer itself, but of the service connections, and its age, especially in sections having an unstable foundation. Milwaukee and vicinity has all kinds of ground conditions, and poor as well as good sewers so far as water-tightness is concerned. The minimum night flow from three large districts, gaged after a long rainy period, showed a flow of 1,620 gallons per acre, which was adopted as the ground-water unit for areas having present sewer systems. Only half this amount, however, is used for new areas where the sewers are built under our specifications and inspection.

Storm-water run-off was determined in the usual way from Weather Bureau Records. A hypothetical rainfall curve was first selected having a uniform rate of 3.5 inches per hour for the first fifteen minutes and then decreasing as the time increased. This curve was reduced to 70 per cent in fully built-up commercial areas, and an inlet time of 5 minutes allowed. In residential areas it was reduced to 30 per cent and a 10-minute inlet time allowed.

ACKNOWLEDGMENT.—From a paper read before the American Society for Municipal Improvements, at Des Moines, Iowa.

Anti-Noise Campaign Planned

PRELIMINARY plans for a country-wide effort to end ear-splitting, nerve-racking sleep-wrecking, health-destroying noise were announced recently by H. W. Mowery, Chairman of the Elimination of Harmful Noise Committee, American Society of Safety Engineers, which comprises the engineering section of the National Safety Council.

Studies of the din made by the cars and tracks of the elevated, underground, and surface transit corporations in various cities, noise in power transmission and central stations will be undertaken by the committee, which intends to secure scientific cooperation from physicians, psychologists, and psychiatrists who will be invited to serve on this special committee. Use will be made of instruments to ascertain the different intensities that result in harmful effects. The psychology of noise will be given careful consideration.

No-Stop Traffic—An Attainable Ideal?

By George T. Street, Jr.

EVERY driver has had that pleasant experience of approaching an intersection blocked by a stop signal, and seeing it turn to "Go" just in time to allow him to proceed without slacking speed. Of course the opposite seems to occur much more frequently. Have you ever wondered how it would seem to run along through a city with the signals clearing for you as regularly as clockwork at every intersection without fail, just as if for your own special benefit? And—here's the startling thing about it—has it ever occurred to you that it could actually happen, not only to you but to every other motorist at the same time?

Offhand, it sounds like a pipe-dream. As a matter of fact, it is physically possible, and it is an open question whether the plan could be put into practical operation. The reader will naturally object that the "Go" sign could not open to motorists on both of two intersecting streets if they arrived at the intersection at the same time, and that if such a thing could happen there would be disastrous consequences. The answer to this objection is that a no-stop traffic control plan would make it impossible for cars to approach an intersection on both streets at the same time; in other words, traffic would have to be controlled not only at the intersections but also between them.

To get a clear idea of the working of the plan, we may think of the ideal city (for traffic) in which all of the streets are cut up into blocks of exactly the same length. We may think of the north-south streets as First Street, Second Street, etc., and the east-west streets as Avenue A, Avenue B, etc. We may start out from the intersection of First Street and Avenue A, driving north toward Avenue B. One block ahead of us at Avenue B we can see east-west traffic crossing our path, but there is no north-south traffic at that corner. Two blocks ahead, at Avenue C, north-south traffic is running but there is no east-west traffic. As we look all the way up First Street we see that the traffic alternates in this way thoroughout its length. As we watch the traffic, we notice that all of the groups hold together somewhat, instead of scattering. We move up First Street with our group, and while we are still some distance from Avenue B we notice that east-west traffic there has ceased, leaving our way clear. The same thing has happened farther up First Avenue at Avenues D, F, H, etc. Just before we reach the corner the sign changes to "Go," and we keep on going. We notice that the

For a Nearer Approach to Continuous-Movement Traffic

The author of this article claims no originality in the idea of the platoon method of traffic control; but his outline of the proposal and of the advantages which would follow its adoption in an "ideal" traffic city is so clear that its publication will, we believe, result in at least a partial application of the method in an increasing number of cities.

One of the earliest proposals for the "platoon" or "coordinated" system of traffic control was made by Ernest P. Goodrich, consulting engineer, of New York City. Mr. Goodrich has been studying the subject for some years and the methods which he now advocates are outlined in an article by him entitled "A Forecast of Traffic Needs for the City of the Future," in the "National Safety News" for February, 1926.

Los Angeles has been experimenting with the platoon method of traffic control under plans developed in the City Electrician's office during the last six years, under the direction of R. T. Dorsey, Inspector of Traffic Signals.

In reply to an inquiry from the editor of The American City as to the success of this attempt to provide continuous-movement traffic in the down-town streets of Los Angeles, Miller McClintock, Traffic Consultant of that city, writes us under date of January 23 as follows:

"At the present time we are utilizing this alternate method of signal control on all of the north-and-south streets in the business district. The master timer in the central control station is adjusted for intervals based on a careful study of typical vehicular speeds between intersections. My observations lead to the belief that approximately fifty per cent of the vehicles on these streets are able to make two or three signal openings without interruption. While the plan is theoretically perfect, variations and interruptions in the traffic flow are such as to limit anything like a perfect function of the scheme. Mr. Street has laid down, I believe, the ideal conditions for its operation. The fact that the method is not one hundred per cent perfect in practice does not at all mean that it is not a much more rational timing plan than straight synchronization."

The charts which accompany this article are based on a pamphlet entitled "Traffic Coordination," copies of which may be had on application to Omar D. Adams, of Davenport, Iowa.

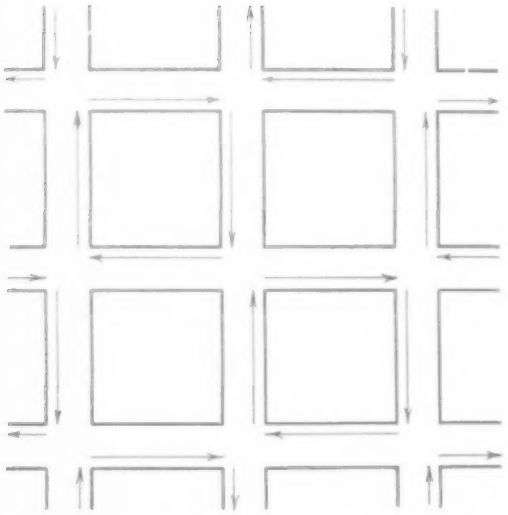


CHART 1.—SHOWING THE POSITION OF TRAFFIC JUST AN INSTANT AFTER THE SIGNALS HAVE CHANGED

Arrows indicate "groups" of cars—the number that may be traveling within a block

signs everywhere have changed at the same time. We are now blocked by east-west traffic at Avenue C, but the same thing happens again. It happens everywhere. We move in a group. A group crosses our path and gets out of the way and we continue without a pause. We cross the path of east-west traffic, but it is never close enough to us to be held up. If we had started out in any other direction the result would have been the same. The north-south groups and the east-west groups simply interweave.

The possibilities of this plan begin to unfold when we consider the various angles of it. For the sake of definiteness, our ideal city may be thought of as having ten blocks to the mile and a speed limit of twenty miles per hour. These are fairly representative figures. A car traveling at the legal limit would cover a city block every eighteen seconds, and our traffic signals, all operated from one central point, would turn at intervals of that length. Traveling at the allowed speed, once you clear the first intersection of your journey you will have a clear path without interruption as long as you continue straight ahead without a turn. If you start out faster than the limit, you will not get farther than two blocks before you find the "stop" set against you. You cannot speed without passing "stop" signals. If you travel slower than the even twenty miles per hour you will have to stop with just about the same frequency as under existing traffic control, unless you drive at some even fraction of twenty miles, as ten or five.

No doubt a caution signal would be desirable, as it is used at present. If five seconds were allowed as a warning, the equivalent in distance for a car traveling at the limit speed would be 146⅔ feet, a distance in which the car could easily be brought to a stop. Drivers would no doubt learn in a short time to estimate the distance, so that a warning signal would tell the laggard that he must either accelerate his speed to catch up with his group or wait at the intersection for the next group going his way. On the other hand, a driver forging ahead of his group would find himself approaching too close to an intersection before seeing the warning signal and would know that he was ahead of schedule and that he must reduce speed.

It might seem that the grouping of cars necessitated by this plan would increase congestion, because large areas of roadway would be left unoccupied between the groups. As a matter of fact, that grouping would not be unlike the city traffic we now have, except that the groups would not have to jam as they do when held up by a signal under existing conditions. There would be no actual loss in the percentage of roadway actually in use or, to put it the other way, in the number of cars that could travel comfortably on a given street. On the other hand, by cutting in half the time necessary for a car to cover a given trip, the plan would actually have about the same effect as reducing the traffic by fifty per cent. Since the problem of traffic control hinges largely on this very question as to how

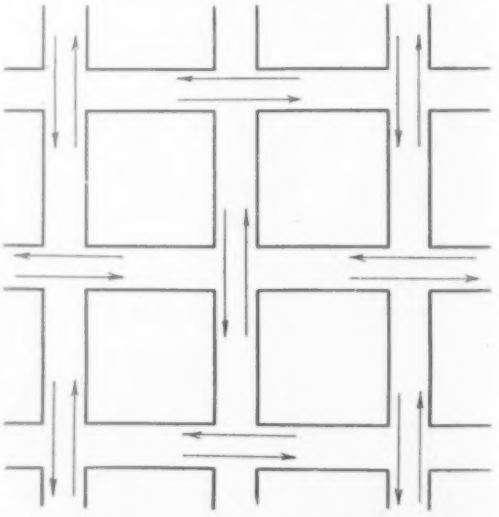


CHART 2.—SHOWING THE POSITION OF TRAFFIC HALF AN INTERVAL LATER THAN THE POSITION SHOWN IN CHART 1

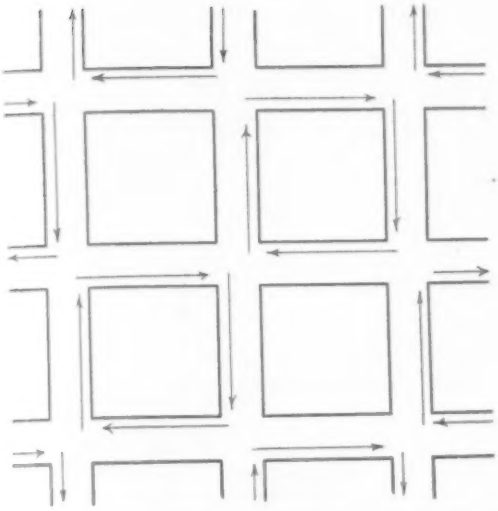


CHART 3.—SHOWING THE POSITION OF TRAFFIC JUST AN INSTANT BEFORE THE SIGNALS CHANGE

much traffic our streets can accommodate, a system that would actually cut in half the number of cars in any one block at a given time would give us a new lease on life and a chance to catch up with traffic problems that are at present far beyond us.

Turning is a difficulty in any traffic plan. In this one it would seem to be relatively easy, since a driver by lagging at the rear of his group could always be sure of a clear field behind him and a chance to enter a cross-street between groups traveling in his new direction. The same variety of regulations for right- and left-hand turns that we now have would still be possible.

Diagonal streets would offer the same old difficulties. They would require careful control under the supervision of traffic officers, and in some cases would have their stop signals operated separately instead of synchronized with the others. Such streets and those that are divided into blocks of widely varying length would offer really serious difficulties in adapting the system to a city that is not ideal. In general, however, traffic officers would have a minimum of duties and in many cases could be given other duties. Relief from the duty of operating the signals would leave them free for emergencies and with plenty of opportunity to assist pedestrians. In at least one eastern city the effort to control pedestrian traffic has progressed to the extent of arrests and fines, and we may expect increasing attention to this problem. It should be mentioned here that the eighteen seconds of "Go" in our ideal city would account for 52.8 feet of travel at the rate of 2 miles per hour, which is slow walking. That would enable almost any one to get across a fairly wide street. Thoroughfares as wide or wider usually have "islands" in the middle for the safety of pedestrians. Moreover, we may take into account the fact that such a plan as is outlined here is just as susceptible as any other to the exercise of common sense, and the flexibility of car speeds is such that a group of cars might be compelled to slow up a little for foot traffic and easily make up the loss in the next block.

Privileged cars, such as fire departments, police cars, and ambulances, would be able to get through traffic more easily, since there would be less congestion than we now have. Normal traffic would be resumed more easily after interruptions of this kind.

Briefly outlined, the advantages of this method of control would be:

1. Traffic would average a speed equal to the speed limit, instead of half that or less.
2. The volume of traffic that could be handled in a given place and a given time would be just doubled.
3. Speeding would be made impossible, except as it would involve a total disregard for stop signals. The incentive to speeding would also be largely removed.
4. The duties of traffic officers would be so reduced and so simplified that the officers would devote a major part of their attention to the pedestrian.
5. There would be no tedious waiting for the "Go" signal. This means less wasted gas and slower wearing-out of the engines. The continuous driving, without repeated stopping and starting again, would eliminate a lot of wear and tear on both the car and the driver.

"SOLVING THE TRAFFIC PROBLEM"

is the title of a new booklet by Hugh E. Young and Eugene S. Taylor, copies of which may be had on application to Mr. Taylor at 3821 West Adams Street, Chicago. The booklet outlines, with numerous illustrations, a plan for the simultaneous control of all traffic within the area of greatest congestion in a city. Signals are both synchronized and coordinated in a manner which the authors believe will provide for the nearest possible approach to continuous movement of traffic.

The booklet also describes and illustrates a proposed new style of multiple-floor, double spiral ramp garages to be built at strategic points on transportation lines around the fringe of the central business district.

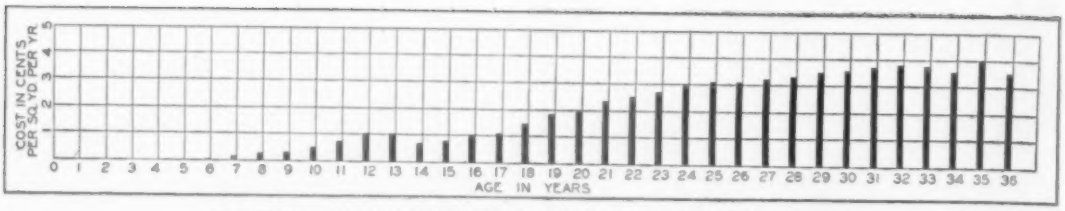


FIGURE 1.—ASPHALT PAVING—COSTS FOR ALL PAVEMENTS

Repair Costs of City Pavements

By R. H. Simpson

Chief Engineer, Division of Engineering and Construction, Columbus, Ohio

DURING the past few years considerable investigation and research work has been carried on by various agencies for the ultimate purpose of determining improved methods of design and construction of roads and pavements. The greater part of these investigations has consisted of a study of the behavior of pavements that were constructed especially for the purpose of testing them under known traffic conditions. The conclusions reached have given us information of value relative to the required strength of pavements to resist the strains produced by moving loads, but they do not tell the whole story of pavement wear or weakness, because they do not take into consideration all the factors that enter into the life and wear of pavements; such as the continuing action of the sun, rain, snow, ice, frost, etc., each of which acts differently on different types.

While the contributions to the literature on the general subject of roads and pavements have been rather voluminous, it is quite astonishing that so little is known, or so little has been published, on the subject of wear or of maintenance cost. Surely these are important considerations, for, to determine the economic pavement we must know not only the first cost but the ultimate cost.

Comparative Costs Generally Misleading

It is true, of course, that many figures on the cost of maintenance of roads are published in the reports of various highway departments, but they are usually given in terms of cost per mile, and include a lot of miscellaneous work other than the actual repairs to the pavement, and, therefore, it is impossible to make any comparisons. There are also occasional reports made on repair costs of city pavements. These also are usually given in such terms that it is difficult to form a basis for definite conclusions and comparisons. For instance, we frequently see a report from some city that the cost of maintaining a certain type of pavement for a certain year was 2 cents per yard and that the cost for another type during the same year was 2½ cents per yard, and the inference is that the latter is the more expensive type from the standpoint of maintenance, which may or may not be true. This information is usually misleading, unless other factors affecting the cost are stated, such as the relative age of the pavements and the character and volume of traffic carried.

To illustrate how misleading data of this kind may be, it may be stated that during the year 1924 there was expended on the 3,900,000 square yards of brick pavements in Columbus about $90,000, or $0.023 per yard, and on 1,800,000 square yards of asphalt pavements about $19,000, or $0.011 cents per yard. This would indicate that the repair cost for brick pavements is more than twice as much as for asphalt pavements, which is not true, the greater cost for brick being due, in part,

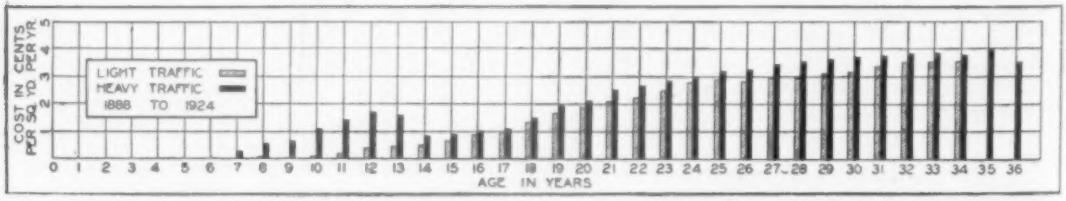


FIGURE 2.—ASPHALT COSTS COMPARED FOR LIGHT- AND HEAVY-DUTY PAVEMENTS

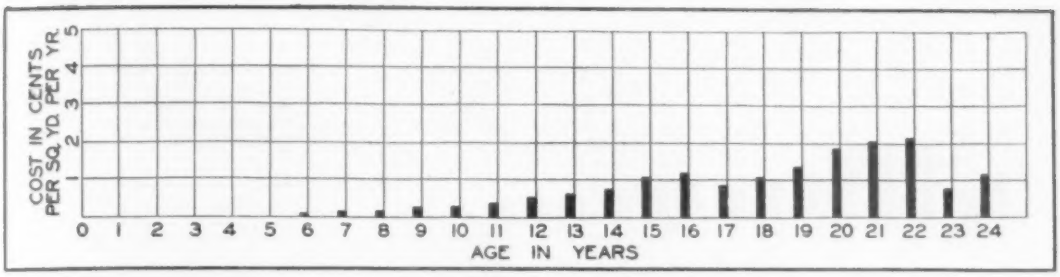


FIGURE 3.—BRICK COSTS FOR ALL PAVEMENTS

to the fact that the average age of the brick pavements is greater than that of the asphalt. I think we may all agree that as a pavement becomes older it will cost more for maintenance and that unless we know the age of a pavement or something of the traffic it carries, the repair cost does not mean much and is misleading. On the data presented herein the repair costs will be given in terms of the age of the pavement, and the analysis will show costs compared for light and for heavy traffic.

Character of Columbus Pavements

In order that you may know something about the character of the pavements under discussion, it will be well to give briefly a few facts about their construction and maintenance.

Prior to 1900 the asphalt pavements in Columbus were laid on a 6-inch natural cement concrete base, except for a few improvements, where old boulder pavements were resurfaced with asphalt. Subsequent to 1900 a portland cement base 6 inches in thickness has been used. During the first few years the concrete mixture consisted of one part cement, four parts sand, and eight parts crushed stone or crushed gravel. This mixture has been strengthened from time to time, and for the past twelve years the proportions have been one part cement, two and one-half parts sand, and five parts stone. The thickness of foundation has remained at 6 inches. Subsequent to 1900 the use of subdrains along each curb line has been standard practice. During the past twelve years about 175,000 square yards of asphalt has been laid over old brick pavements. The asphalt mixture has followed standard practice in sand grading and has contained from 10 to 11 per cent bitumen. About 82 per cent of the yardage is Trinidad Lake asphalt and 18 per cent oil asphalt. On most of the improvements the wearing surface has been 1½ inches of sheet asphalt laid on 1½ inches of binder. During the past ten years, however, a 2-inch sheet asphalt top has been used almost exclusively on heavy-traffic streets.

Prior to 1900 the brick pavements were laid on a macadam base, the joints in most cases being filled with coal tar pitch. Subsequent to 1900 the base has been the same as described for asphalt pavements. Between 1900 and 1910 pitch was used almost exclusively for the filler. From 1910 to 1915, a cement filler was used on a considerable portion of the pavements. Since 1915 asphalt filler has been used almost exclusively. Both shale and clay brick have been used, and since 1900 the standard rattler test has been required on all construction.

Repair Methods

Practically all of the repair on asphalt pavements has been done by the "cut-out" method. Surface heaters have rarely been used. Prior to 1907 the asphalt repairs were made by contract, the repaired area being measured and payments made on a unit price

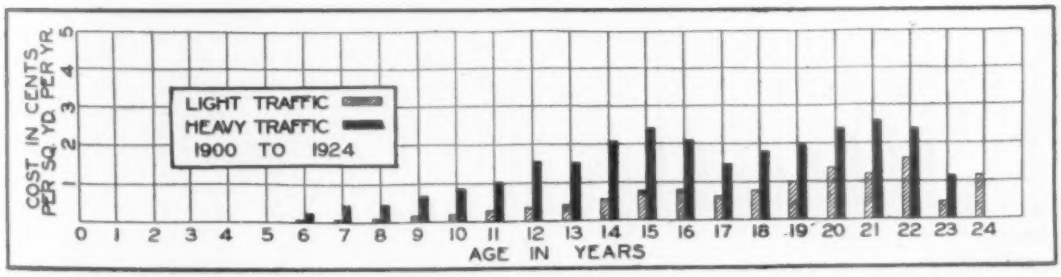

COST IN CENTS PER SQ. YD. PER YR.
1 2 3 4 5
LIGHT TRAFFIC
HEAVY TRAFFIC
1900 TO 1924
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
AGE IN YEARS

FIGURE 4.—BRICK COSTS COMPARED FOR LIGHT- AND HEAVY-TRAFFIC PAVEMENTS

basis. Since 1907 all repair work has been done by city forces. To ascertain the cost of repairs of asphalt pavements, the repaired area is measured and recorded at the time the repair is made, but the unit cost to be applied is determined at the end of the season's work, by dividing the total expense for the year, including labor, material, supplies, repairs to equipment and plant, a charge for use of plant, superintendence, etc., by the total yardage of repair made. This gives a unit cost to apply to each pavement and a total for it that is not influenced by the location of the pavement nor its distance from the plant. A more rational comparison between pavements is thus obtained than if the actual repair cost of each particular improvement was used.

The repairs to brick and block pavements are handled by small crews furnished with the necessary supplies, tools, and equipment for such work. These crews are supervised by a general foreman who measures all repaired areas. In the case of brick and block pavements, the actual cost of the work in each particular improvement is recorded as the work progresses, to which is added 15 per cent to cover the cost of handling materials at the yards, the repairs to tools and equipment, superintendence, etc.

Maintenance

The maintenance of all pavements in Columbus has always been under the direction of the Chief Engineer of the Service Department, and in direct charge of two deputy engineers, one on asphalt repairs and the other on other types. A record of the repair costs has been kept for many years past. In the case of asphalt, the record is complete for all pavements constructed since 1888, and for brick and other types those constructed since 1900. The work of tabulating and classifying the figures has been completed for all asphalt and brick pavements, about 1,000 separate improvements, totaling 5,700,000 square yards, of which 1,800,000 square yards are asphalt and 3,900,000 square yards brick. At the end of the year the repair costs for all pavements are recorded on cards prepared for the purpose, one side showing the construction data and the reverse side the maintenance data for the pavements.

The maintenance data on these cards consist of the area of the improvement; the area repaired each year; repair cost each year; the unit cost in terms of total area; the cost per yard per year; and the total cost to date, or accumulated cost. The cost per yard per year is really the service test of a pavement, and gives a more rational comparison between two or more pavements than if the actual cost at each age period is used, as the latter is usually erratic because of the influence of shortage of repair funds in some years. The cost per yard per year is the average yearly cost of repairs for the period under consideration. It is obtained by dividing the total cost of repairs for the given number of years by the area of the improvement, and this quotient by the number of years. For example, the total yardage of all asphalt pavements that have been in service ten years is 660,027. and the total expenditures for repairs on these pavements during this ten-year period has been $33,044. By dividing this sum by the yardage and then by 10 we get $0.005, which is the cost per yard per year for ten-year-old asphalt pavements. In this manner the repair cost for all brick and asphalt improvements has been ascertained.

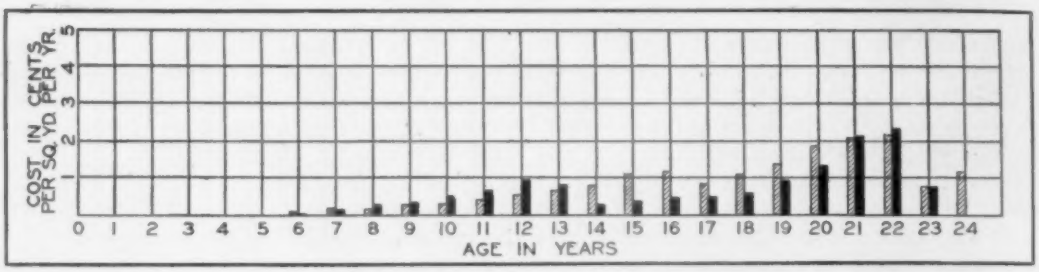


FIGURE 5.—ASPHALT AND BRICK COSTS COMPARED FOR ALL PAVEMENTS

Our paving contracts call for a five-year guarantee, so that the figures on repair cost include only the expenditures made after the expiration of the guarantee. It may be stated, however, that in only a few cases are repairs required during the guarantee period, and usually these are due to some defect in base or sub-base, and it is a rare case when these repairs are of any magnitude.

Figure 1 shows graphically the repair costs of all asphalt pavements in the city for all ages from one to thirty-six years. This is

made up from the costs of about three hundred separate improvements and is therefore the average cost, without any consideration given to volume or weight of traffic. It will be noted that except for a more rapid increase in cost from the tenth to the thirteenth year, the cost increases somewhat uniformly each year. The increase is, however, more rapid from the fifteenth to the twenty-fifth year than for any other ten-year period.

In Figure 2 there is shown a comparison of the cost of repairs of light-traffic and heavy-traffic pavements. In the absence of data obtained by a traffic count, such a division is somewhat arbitrary, but in explanation it may be said that in dividing pavements into these classes, all those in business sections and in railway terminal districts and all thoroughfares have been considered as heavy-traffic pavements and all others as light-traffic. It will be noted that the repair costs for light-traffic pavements increase rather uniformly up to the seventeenth year, after which the increase is somewhat rapid. The heavy-traffic pavements, however, show a marked increase from the ninth to the twelfth year. From the fourteenth to the eighteenth the cost is less than at the twelfth-year period, but increases again rather uniformly up to the thirtieth year. It is interesting to note that there is very little difference in repair costs of light- and heavy-traffic pavements after the fifteenth year. As would naturally be expected, however, the latter is in excess of the former at all ages.

Figure 3 shows graphically the repair costs of brick pavements from one to twenty-four years. The figures were obtained in the same manner as described above for asphalt, and represent an average cost of all pavements in the city without considering any variation in volume or weight of traffic. It will be noted that the increase in cost is uniform from the first to the fourteenth year. The period of heavy maintenance is at the fifteenth and sixteenth year and, following a decrease, is rather rapid up to the twenty-second year. The low cost for the last two years is due to the fact that the only pavements of this age have carried very light traffic.

Figure 4 shows a comparison of repair costs of light- and heavy-traffic brick pavements, the division into these two classes being made in the same manner as described above for asphalt pavements. It will be noted that for the heavy-traffic pavements the increase in repair cost is rather uniform and rapid for the first fifteen years, reaching a maximum at the latter age period. The cost drops following this period, but increases again to a higher maximum for the twenty-first year. The cost for light-traffic pavements increases rather uniformly to the twenty-second year, reaching a maximum at that period.

Figure 5 shows a comparison of repair costs for brick and asphalt pavements. This comparison is for those pavements constructed since 1900, the same type of base being used for both. It is interesting to note that there are two periods of heavy maintenance on each type, the repairs on asphalt reaching a maximum at the twelfth and the twenty-second year, and those on brick at the sixteenth and twenty-second year. It will also be noted that during the earlier years the repair cost for asphalt is a little higher than for brick at the same ages, while the reverse is true for the later years, the repair costs for brick being in excess of those for asphalt from the fifteenth to the twentieth year.

Figure 6 shows a comparison of repair costs for heavy-traffic brick and asphalt pavements. It will be observed that on the former the cost increases with the age at a fairly uniform rate from the sixth to the fifteenth year. Beyond the latter age there is a lower cost for a few years, followed by an increase which attains the maximum at the twenty-first year. The repairs for asphalt maintenance show a marked increase in cost during the earlier years, with a maximum at the twelfth year. Following this there is a decidedly lower cost from the fourteenth to the twentieth year, with another marked increase which reaches

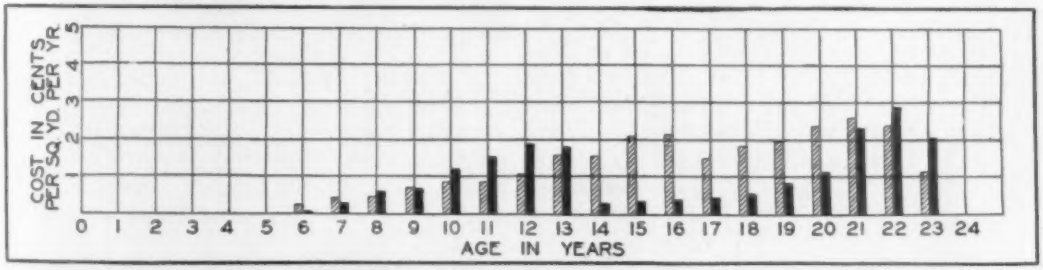


FIGURE 6.—ASPHALT AND BRICK COSTS COMPARED FOR HEAVY-TRAFFIC PAVEMENTS

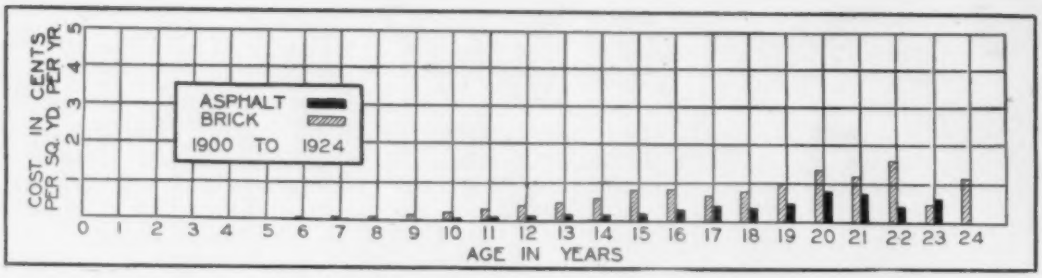


FIGURE 7.—ASPHALT AND BRICK COSTS COMPARED FOR LIGHT TRAFFIC

a maximum at the twenty-second year. It is interesting to note that there is a period of heavy repair cost on both types of pavement, the cost on asphalt reaching a maximum a few years before that on brick, but the cost for the latter being greater than for the former from the fourteenth to the twenty-first year.

Figure 7 shows repair costs compared for light-traffic brick and asphalt pavements. It will be observed that the costs on both types increase with age at a fairly uniform rate, both reaching a period of maximum cost at the twentieth year. It will also be noted that the cost for brick is in excess of the asphalt at all ages, the difference being marked after the tenth year.

A study of the data from which these diagrams were constructed has disclosed the fact that a surprisingly large number of pavements, considering each separate improvement as a unit, have been in service for many years before requiring any repair. As would be expected, most of these are light-traffic pavements, although a few pavements carrying moderately heavy traffic have reached the age of ten years before repairs were made. As an illustration, it may be stated that of the 599 brick improvements that have completed ten years of service, with an area of 1,897,511 square yards, 351 of them, comprising a yardage of 911,129, were in service ten years before any repairs were made. This represents 48 per cent of the yardage of ten-year-old brick pavements. The asphalt pavements show about the same percentage at the ten-year period. It is clear, therefore, that the entire cost of repairs on ten-year-old pavements has been expended on about one-half of the yardage of those pavements. The figures show that on thoroughfares where the traffic can spread out over the entire pavement the maintenance is moderate, even where the traffic is large in volume, and that a large portion of repair costs has been expended on thoroughfares where the traffic is concentrated in a narrow path by reason of the location of street-railway tracks in the center and parked cars along the curb.

Figure A shows graphically the yardage of asphalt pavements requiring no maintenance compared with the total yardage at various ages, and Figure B gives the same information for brick pavements. It will be observed that a large percentage of the pavements have given service for ten years without maintenance cost, but, as would be expected, the percentage decreases very rapidly as the pavements become older.

As was noted, the diagrams showing repair costs for heavy-traffic pavements indicate a pronounced rise in cost during the earlier ages. The exact period in which this rise occurs is no doubt influenced by several factors, such as sub-soil conditions, construction details, and traffic carried, and will vary in different localities. On the pavements under consideration it has occurred from the tenth to the twelfth year after construction on asphalt pavements, and on brick in the fifteenth year. Following this period of abnormal maintenance, there is a reduction in cost for several years which is quite marked for asphalt. It should be clearly understood, however, that this period of heavy maintenance is not common to all pavements, as was shown by the last diagrams. Our records show, however, that it occurs on most of the heavy-traffic and on some light-traffic pavements.

To illustrate this characteristic, I will cite you the record of a few individual pavements. An important thoroughfare in Columbus 42 feet between curbs with car tracks in center, which carries a traffic of from twelve to fourteen thousand vehicles daily at the present time, was paved with sheet asphalt in 1911. At the age of eight years the repair cost on this pavement was $0.008 per yard per year. At ten years of age it was $0.045; at twelve years $0.07, and at thirteen years $0.08. We have another thoroughfare in Columbus that

was constructed in 1908. This was a brick pavement 46 feet in width with car tracks in the center, with a concrete base and tar filler. It receives at the present time traffic of about sixteen thousand vehicles daily. Its maintenance cost at various ages has been as follows:

	Per Yard Per Year
Eight years	$0.0008
Nine years	0.021
Ten years	0.02
Eleven years	0.025
Twelve years	0.026
Thirteen years	0.04
Fourteen years	0.07
Fifteen years	0.14
Sixteen years	0.18

Another street, 50 feet in width, containing car tracks, carrying from ten to twelve thousand vehicles per day at the present time, was constructed in 1912, of brick with a cement filler. This pavement was in excellent condition for an eight-year period with a repair cost at that age of about 1/10 of a cent per yard per year, but during the last three or four years we have been obliged to give it considerable maintenance, and the cost up to January 1 this year has averaged 4½ cents per yard per year. In fact, all of the maintenance has been done during the last four years.

Probably the most striking example is a sheet asphalt pavement laid on a portion of a thoroughfare leading to the east. This is a street 50 feet in width which carries at the present time about twelve thousand vehicles daily, and was constructed on a natural cement base in 1890. In 1901 the pavement was in a bad condition, as our records show that the roadway was completely resurfaced that year. In 1913 it was resurfaced for a second time, because the asphalt had disintegrated or broken up on account of ground water coming through the foundation. In 1924 this pavement was entirely reconstructed, as it had been largely destroyed again in the spring of the year, by water coming through the surface, destroying large areas, and it was considered unwise to attempt to repair or resurface same. In the reconstruction of this pavement a number of sub-drains were laid and an asphalt pavement constructed on a new concrete base. This failure was due to an undrained sub-base and a weak foundation, but it is an interesting fact that, in spite of this bad condition, the asphalt surface gave satisfactory service for three successive periods of about eleven years each.

On account of the fact that the period of heavy maintenance is not noticed on all pavement and that its occurrence is uncertain, this period may be called the critical period in the life of pavements. They may pass this period successfully by reason of light traffic or other favorable conditions, or they may develop a weakness before this time by reason of some abnormal condition, but the figures seem to indicate that defects, either in sub-base, foundation or wearing surface, do not necessarily develop until this critical period, and we should not form any definite conclusion as to the merits of a pavement until this critical period has been passed. As indicated by the diagrams, the average heavy-traffic pavement, after passing the critical age period, continues to render service at a less repair cost for another period of years, after which the cost reaches a new and higher maximum. This would seem to indicate that the period of heavy repair cost occurs in cycles, the length of which would vary for different types.

From a study of the figures we can conclude that the repair cost of the average asphalt or brick pavement is moderate at all ages. Expressed in terms of cost per mile for a roadway 18 feet in width, it would average, on pavements constructed subsequent to 1900, at six years of age approximately $7 per mile per year, at fifteen years of age $80 per mile

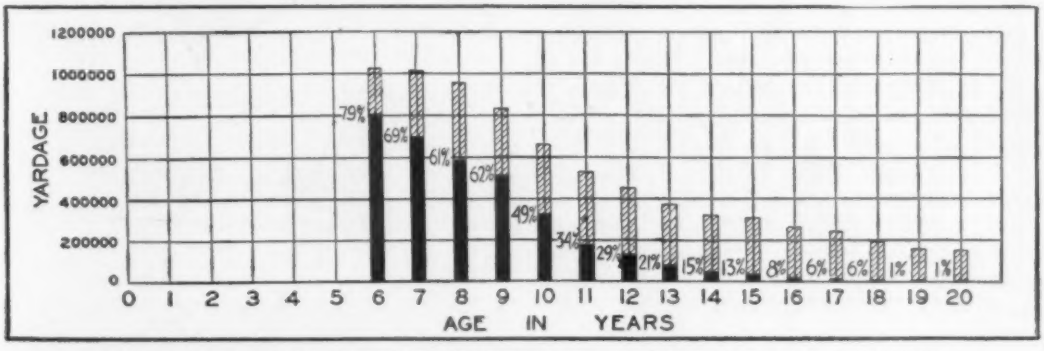


FIGURE A.—YARDAGE WITHOUT MAINTENANCE COMPARED TO TOTAL YARDAGE

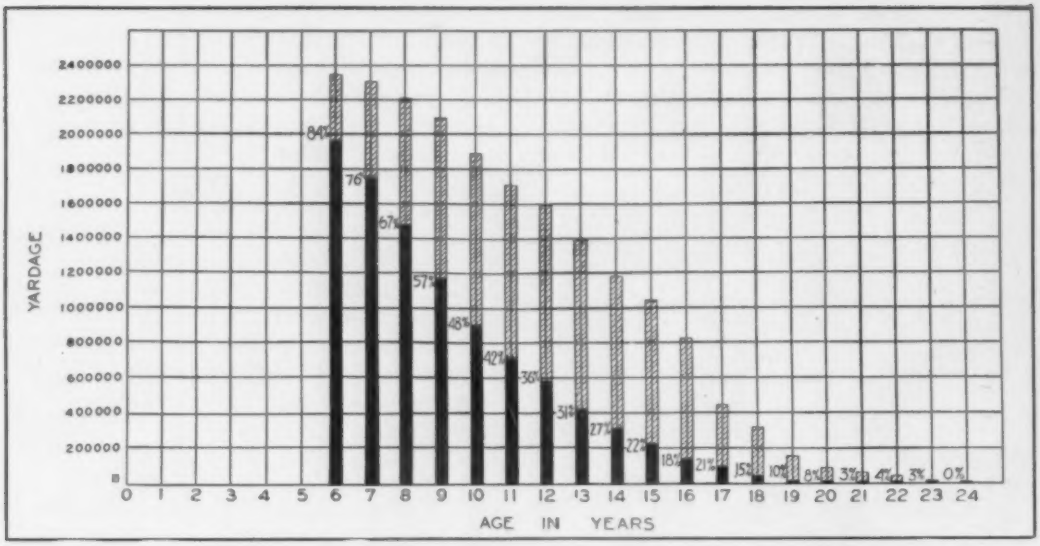


FIGURE B.—BRICK YARDAGE WITHOUT MAINTENANCE COMPARED TO TOTAL YARDAGE

per year, and at twenty-five years of age $200 per mile per year. Our oldest asphalt pavement constructed in 1888 has cost 3.2 cents per yard per year during its life, which, expressed in terms of an 18-foot road, would be $338 per mile per year.

It should be understood that these diagrams represent average figures, and give average results obtained under average traffic conditions common to our cities during the past generation. Some of the pavements are not as smooth as the demands of motor traffic require, but most of them, even the older pavements, are carrying present-day traffic in a manner satisfactory to the motor riding public.

Motor traffic has increased enormously in the last few years. What it will be in another decade is a matter of conjecture, but with our present knowledge of paving materials, paving mixtures, and construction details, it would not seem unreasonable to expect results from present-day construction at least equal to those shown herein.

ACKNOWLEDGMENT.—From a paper read before the Thirty-First Annual Convention of the American Society for Municipal Improvements, at Des Moines, Iowa.

Warning Signs for Unsafe Drinking Water

Michigan Examines All Drinking Water on Roadsides as Aid to Tourists

LAST summer a new road sign was displayed on Michigan's state highways. It was a businesslike gray and black sign that warned, not against the sharp curve, but against a danger of equal importance to the motorist—unsafe drinking water.

Protection of roadside water-supplies has been receiving increasing attention as the number of automobile travelers has increased. A plan for the protection of Michigan's roadside water-supplies was put into operation in July, 1925. Three signs, which are reproduced below, were prepared, of sheet iron, two of them painted gray with black letters and one red with white letters. The one large sign 14 x 27 inches in gray with black lettering is for posting at conspicuous 5-mile intervals along the trunk line. Its warning is brief, but to the point. This sign serves as the introduction to the smaller "safe" and "not safe" signs to be posted at the actual sources of drinking-water supplies.

Supplies inspected include any that might catch the eye of the motorist, such as wells and filling stations, hotels, "hot dog" and cold-drink stands, and schoolhouses. In short, every drinking-water supply conspicuous enough to invite the thirsty traveler has been

THIS SIGN WARNS THE TRAVELER TO TAKE HEED

or is being investigated. The surroundings have been carefully inspected and samples of the water sent to laboratories of the State Department of Health at Lansing for bacteriological analysis.

At first it was planned to mark all supplies examined "safe" or "not safe" on the basis of the field inspection and laboratory analyses, but it was decided finally to use the red "not safe" sign only at those places that were obviously unsafe, such as accessible lakes and streams where tourists might stop. The main reliance was to be placed upon the "safe" sign in educating travelers to drink at that sign, rather than not to drink at the red sign.

Examinations and Postings

The scheme of work involved two parties. The first started July 17, 1925, in the southwestern part of the state at the Indiana line, and consisted of two men who traveled north inspecting drinking-water supplies and collecting and shipping samples to the Lansing laboratory. Their automobile carried a supply of sample bottles sufficient for several days, together with packing material and a small refrigerator. Conditions around each water-supply were carefully investigated to make sure that there were no obvious sources of contamination and that there was reasonable insurance that such would not develop. Each well was given a serial number and spotted on a county map with a description of it. Water samples were kept in the refrigerator during the day and sent each night to Lansing.

About two weeks behind the first car a second car followed. In the meantime the water samples had been analyzed and the results sent to the owner of the supply. When the follow-up man arrived, he asked to see this letter and thereby gained not only a check upon his own identification of the supply, but an indication of the owner's attitude. Supplies found safe by bacteriological analysis and satisfactory as to surroundings were marked with the gray "safe" sign. Wells not approved received no mark at all; the red "not safe" sign was used only at lakes and streams. Emphasis was placed upon the safety indicated by the gray sign rather than upon the danger indicated by the red sign that any property owner might remove as soon as the man who posted it was out of sight.

NO ONE READING THIS SIGN WILL DRINK FROM THE SOURCE IT MARKS

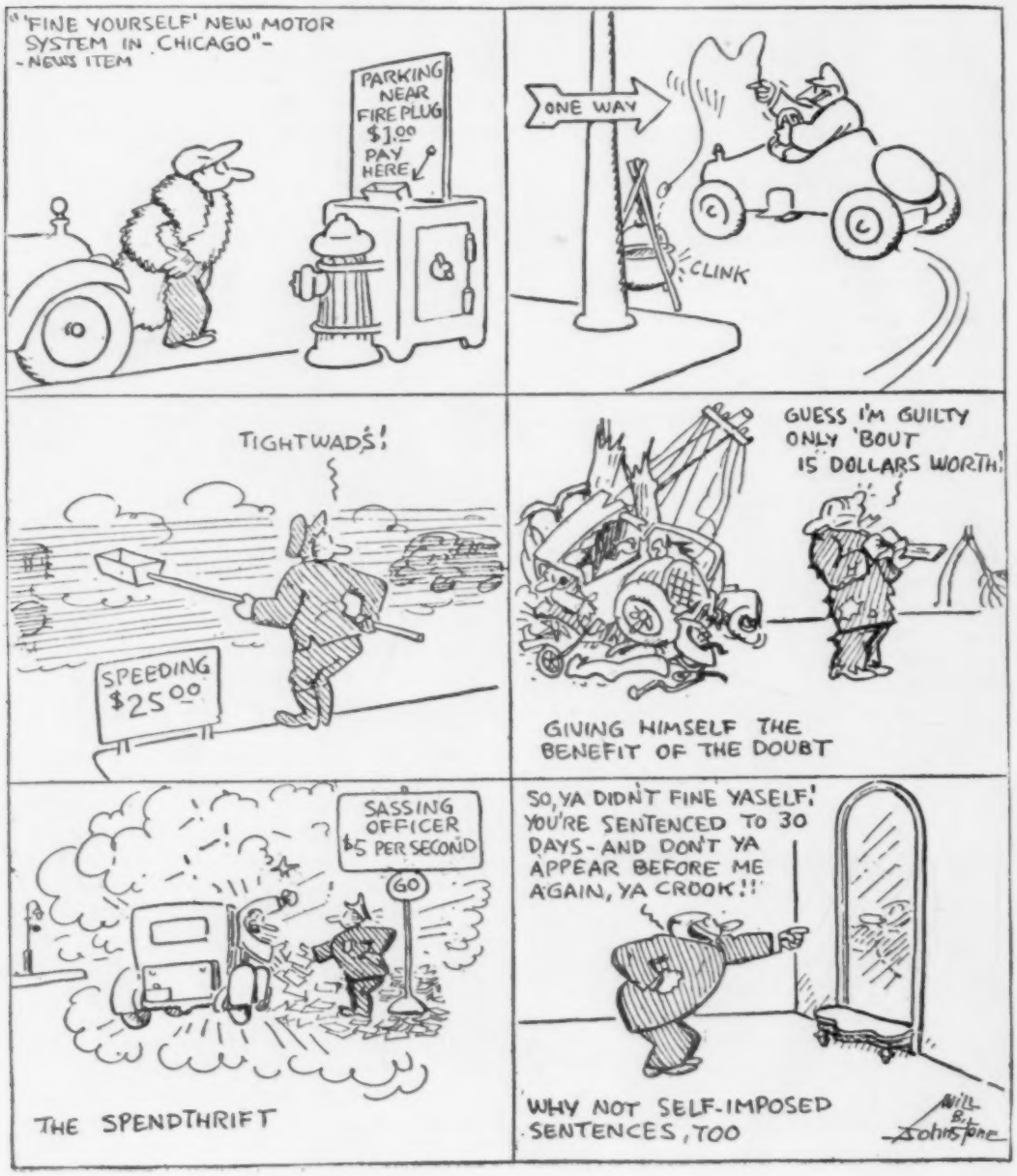
A WELCOME SIGN TO THE THIRSTY TRAVELER

The benefits of safeguarding the drinking-water supply of the motoring public are, of course, impossible of estimation. The difficulties and uncertainty are equally intangible, but a start has been made and, if followed up, promises definite improvement. The small "safe" sign is an economic asset to the person on whose property it appears, and as such it commands the respect of even the sanitarily uninterested. Education both of property owners and highway travelers coupled with frequent reinspections will accomplish results. This is a step which it is hoped other states and municipalities will take in protecting the public in its travel through their communities.

Traffic Fines Self-Imposed

EDITORIAL NOTE.—An Associated Press dispatch from Chicago on March 16 tells of a "fine yourself" system of punishment for traffic law violators about to be inaugurated in that city, which it is hoped will eliminate much of the formal court procedure for minor offenses. Under the new plan violators of minor traffic laws will be given cards by officers. The penalty for the offense noted by the policeman is listed on the card and must be forwarded to the court. On the card is a blank waiver and plea of guilty, which the violator must sign in the presence of the officer unless he wishes a summons to appear in court, as was the former custom.

This system seems to offer an excellent means of saving expense to the city and of reducing loss of time to offenders. Possible extensions of the idea, as suggested by the New York *World's* cartoonist, Will B. Johnstone, are in the drawings below:


"FINE YOURSELF' NEW MOTOR SYSTEM IN CHICAGO"—
-NEWS ITEM
PARKING NEAR FIRE PLUG $1.00 PAY HERE
ONE WAY
CLINK
TIGHTWADS!
SPEEDING $25.00
GUESS I'M GUILTY ONLY 'BOUT 15 DOLLARS WORTH!
GIVING HIMSELF THE BENEFIT OF THE DOUBT
SASSING OFFICER $5 PER SECOND
GO
THE SPENDTHRIFT
SO, YA DIDN'T FINE YASELF! YOU'RE SENTENCED TO 30 DAYS - AND DON'T YA APPEAR BEFORE ME AGAIN, YA CROOK!!
WHY NOT SELF-IMPOSED SENTENCES, TOO
Will B. Johnstone

How Electric Rates Were Reduced in Bellefontaine, Ohio

By F. M. Baxley

Chief Engineer of Public Utilities Plants, Bellefontaine, Ohio

THE municipal electric light and water plant of the city of Bellefontaine, Ohio, which has replaced its diesel engines with steam turbines, has made a decided reduction in both light and power rates and has been able to purchase an additional turbine out of its earnings.

Previous to 1914 all electric current was produced at the West Side plant by two 225-horsepower diesel engines, each direct-connected to 125-kw., 2,300-volt, alternating-current generators. In 1914 a General Electric 300-kw., three-stage turbine generator was installed at the water-works plant, and two of the old boilers were replaced with two 252-horsepower Stirling boilers with Detroit V-type stokers.

With proper attention, the two diesel engine units and the turbine generator should have provided plenty of current and should have given the consumers constant and reliable service. The diesel engines, however, were not carrying their share of the load, and the turbine generator was handicapped by a lack of steam, and by low vacuum and insufficient attention to cleaning. Lack of steam was due both to insufficient boiler capacity and to slowness in cleaning boilers and putting them back on the line.

There was little cooperation between the plants, and the result was poor service; at times consumers were without electricity, water, and gas simultaneously.

Rehabilitation

In 1921 the three public utilities were placed under the present management, with the idea of putting the plants into shape and providing constant, reliable service. The turbine generator was cleaned and equipped with a barometric condenser, and a new set of valves and seats installed. The boiler-room was put on an efficient basis, and boiler cleaning was arranged so that sufficient steam could be applied. A bond issue for $12 000 was made, and $2,000 from earnings was appropriated for use in rebuilding the diesel engines. These were torn down, completely rebuilt, and put in good operating condition.

During this time the 300-kw. turbine generator carried the total load for a period of six weeks, at times carrying a load as high as 425 kw.

The net result of the changes, as shown in the tabulation on page 410, was total earnings of $46,381.82 for the year 1922. The supply of electric current to the consumers was not interrupted at any time during 1922; in fact, there has been power constantly on the lines ever since January, 1922.

As the turbine generator was the more economical of the two types, it was decided in 1922 to install a new unit. This unit, a 600-kw. G. E. five-stage turbine generator, and two new 252-horsepower Stirling boilers with Detroit underfeed stokers, were bought with funds obtained by a new bond issue An addition was built to the water-works plant, with the idea of eventually generating all the current at this plant.

Rates Reduced

The earnings in 1922 justified a reduction in rates, which became effective in March, 1923. The illuminating rate was cut 20 per cent, from 10 to 8 cents per kilowatt-hour, and the power rate, which formerly was a flat 6 cents per kilowatt-hour, was put on a sliding scale of from 5 to 3½ cents per kilowatt-hour, a reduction even greater than that on illumination. Even with the reduced rates, the earnings in 1923 of the electric plants totalled $34,315.75, and in 1924 increased to $48,973.87.

In February, 1925, the rates were decreased an additional ½-cent per kilowatt-hour, bringing them down to a point where they are as low as the rates in large cities, and lower than the rates in any of the cities near Bellefontaine.

A new 750-kw., five-stage G. E. turbine generator with jet condenser was installed in 1924, and put into operation early in 1925. This unit, which cost $34,000 complete with foundations, was paid for out of the profits resulting from the operation of the previous units. No bond issue was necessary for this additional equipment, nor will any be needed for future equipments. The last two boilers, the new condenser for the 300-kw. unit, the coal trestle, and other improvements, have also been paid for out of the earnings. In addi-

tion, earnings are being used to retire the bonds at a rate which will complete their retirement in ten years.

The city has had its street lighting free, a service for which a private corporation would charge at least $17,500 per year, based on $50 per year for 314 street and white way lights, and $40 per year for 46 alley lights.

Plant Equipment

The present main plant consists of the three General Electric turbine generators, and four 252-horsepower Stirling boilers—two with Detroit underfeed stokers and two with Detroit V-type stokers. The two larger turbines have jet condensers and the other a barometric condenser. Water is cooled with a spray pond, and a vacuum of 28 inches is maintained. The stokers burn Kentucky nut, pea, and slack coal. Steam is generated at 225 pounds pressure and 125 degrees superheat. The diesel engine plant, which is now used to help carry the peak loads, will probably be shut down in the near future.

The statement for 1924 shows a total maintenance cost of $3,498.20. It might be expected that the turbine generating units would account for a part of this, but, on the contrary, none of it represents turbine repairs. Other than brushes, the only repair made to any of the three units was the renewal of valves and seats on the 300-kw. unit when the present management took charge.

In 1924 the turbine generators produced most of the current, generating a total of 1,975,310 kilowatt-hours. The average load was 631 kilowatts, and the cost of current at the board about $.02 per kilowatt-hour.

Most of the current was produced with the 600-kw. machine. The 300-kw. unit helped carry the heavy load during November, December, and January, when the load was often more than 1 000 kw. A load as high as 800 kw. has been carried on the 600-kw. machine, which has also carried its rated capacity with the turbine running non-condensing.

With the addition of the new 750-kw. unit, there is sufficient capacity to start motorizing the water-works. One compressor has already been changed to electric-motor drive, and other changes will follow.

The motorizing of the pumps will give a load which will permit production of power still more cheaply.

CITY OF BELLEFONTAINE, OHIO, ELECTRIC LIGHT PLANT—1924

RECEIPTS

Collections	$123,047.35
Refunds	90.12
Deposits for service	508.00
Interest on deposits	414.64
Sale of real estate	1,101.00
Total receipts	$125,161.11
Balance January 1, 1924	13,046.73
	$138,207.84

EXPENDITURES

Office

Salaries	$ 2,535.00
Furniture and fixtures	130.64
Stationery	693.62
Incidentals	193.76

Manufacture

Operation	$ 52,137.20
Maintenance	3,498.20
Distribution maintenance	8,938.20
Return of deposits	293.00
Refunds	90.12

Extensions

Buildings and equipment	$ 21,972.53
Lines and service	5,156.98
New meters	1,610.72
Bonds and interest	17,000.00
Total expenditures	$114,249.97
Balance December 31, 1924	23,957.87
	$138,207.84

1924

Total operating receipts	$123,461.99
Total operating cost, including interest on bonds	74,488.12
Earnings	$ 48,973.87

1923

Total operating receipts	$119,458.29
Total operating cost, including interest on bonds	85,142.54
Earnings	$ 34,315.75

(Note: Rates reduced March, 1923)

1922

Total operating receipts	$124,927.49
Total operating cost, including interest on bonds	78,545.67
Earnings	$ 46,381.82
Total current produced by turbine generators, 1924 (kw. hrs.)	1,975,310
Cost of current produced by turbine generators on the board per kw. hr.	$.02

RATES FOR CURRENT, PER KW. HR.

	Previous to March 1923	March, 1923 to Feb., 1925	Present Rates
Illuminating	$.10	$.08	$.075
Power			
First 2,000 kw. hr.	.06 flat rate	.05	.045
Next 3,000 kw. hr.	.06 " "	.045	.04
Next 5,000 kw. hr.	.06 " "	.04	.035
Over 10,000 kw. hr.	.06 " "	.035	.03

(Ten per cent discount on all above rates for prompt payment.)

Note.—"Total operating cost, including interest on bonds" in above tabulation includes all operating cost, insurance, interest on bonds, and the retiring of them when they come due. Depreciation is cared for by maintenance of equipment, and the addition of equipment in operating cost. The laws of the state of Ohio do not permit a fund for depreciation, and therefore there is appropriated semi-annually the amount which will care for depreciation. It is therefore a part of the operating cost. Cities operating public utilities in the state of Ohio are not required to pay taxes. This figure is more than offset, however, by the street lighting, for which no charge is entered.

The Street-Lighting Section of the 1926 Muncipal Index contains a worth-while discussion of the design, construction, and financing of street-lighting installations.

The Cost of Inadequate Street Lighting

By Charles J. Stahl

STREET-LIGHTING projects are increasing at a rapid rate, both in number and in magnitude, for the nation is becoming conscious of the cost of inadequate lighting—this in spite of a natural expectancy that we might be slow to arrive at the adequate use of artificial lighting, since the efficient illuminants now available are of such recent development.

Only seventy-three years ago homes were lighted with sperm oil. The average home then used 25 candle-hours per night, or 9,000 per annum, costing approximately $24. To-day the average home uses a little more than twenty times as much at about the same cost. In other words, we have increased twenty times in the last seventy years, whereas we hardly doubled in all the preceding ages. In street lighting we have had approximately the same rate of progress, but the necessity for the artificial illumination of streets has greatly increased, whereas in the home our needs are essentially the same as fifty or one hundred years ago.

THE MODERN STREET-LIGHTING EQUIPMENT OF SEVENTEENTH STREET, WASHINGTON, D. C.

More urgent need for the adequate lighting of our streets has come about, as we all know, by the enormous increase in the volume and speed of street traffic. We do not immediately appreciate the benefits of good street lighting in relation to this traffic, and we do not know it all yet, but we are beginning to realize that nationally we should have a better economic balance between the cost of street lighting and the needless losses resulting from its inadequate use. No specific formula for the determination of adequate costs can be prescribed. Conditions are, of course, not the same in all communities. The costs of providing street-lighting services vary. The style of equipment preferred varies. In all cases the purposes for which street lighting is desired are fundamentally the same, but they sometimes vary as to order of importance.

On the other hand, the cost of inadequate street lighting does not vary greatly. Where we have traffic of given volume, speed, and density, there is inevitable traffic-accident hazard and loss until we bring to bear what influences we have in the form of traffic control and street lighting, and then there is still some loss, but not so much.

We do not know exactly what our national cost of inadequate street lighting is, but some pretty well founded estimates have been made. It is easy enough to appraise the cost of re-

placing a wrecked automobile in apparently first-class condition, but we cannot evaluate the economic loss to the community and society as a whole when on a poorly lighted street a preventable accidental fatality occurs.

Economic Loss from Traffic Accidents

From an analysis of accurately compiled statistics on traffic accidents in many of our larger cities, it was determined that a certain percentage were directly attributable to inadequate street lighting. This percentage applied to the record for the entire United States and, evaluated on a logical economic basis, showed a total preventable property accident loss of more than $50,000,000, which is more than the present annual expenditure for all street lighting in the United States. This takes no account of the life hazard.

We have been thinking in terms of the cost of street lighting, and this is natural, for we must speak in terms of cost in building budgets, and budgets grow without much of a building effort. However, if we will at times stop to consider the cost of inadequate lighting, we shall be able to reach a better economic balance for determining in what measure funds should be allotted to street lighting.

The Total of Other Losses

I have mentioned only the item of traffic accidents. There are equally definite figures showing the potentiality of street lighting in crime reduction. Statistics on this phase of the subject have been presented before, and the Street Lighting Committee of the American Society for Municipal Improvements has a fund of information available on this subject. I do not know of any effort so far made to determine in dollars and cents what actual saving could be effected in this direction. The problem seems difficult and in all probability can only be roughly estimated; however, it would probably yield another total sum of $50,000,000.

The expenditures necessary for good street lighting can be justified by available traffic and crime statistics. There are, however, other benefits which we fail to enjoy where the lighting is inadequate. In residential areas the feeling of safety, comfort, and convenience is worth the cost. Real estate promoters know that it increases property values.

Overcoming Inadequacy

These, in conservative judgment, are some of our costs of inadequate street lighting, and, fortunately, good street lighting is gaining popularity at a very rapid rate. In some cases this growth does not spring from a calm, scientific appraisal of its worth, but is rushed as an emergency measure to overcome distressing conditions of traffic and crime. Improvements so carried out are not always handled to best advantage. Many economies are assured through advance planning. Street-lighting plans should run far in advance of immediate requirements.

In past years the usual practice has been to confine street-lighting improvements to limited sections. Street lighting has often been scattered through the agency of localized improvements carried out as private developments or in the form of improvement districts. Nearly always the aim has been to boom a restricted area to commercial leadership through the establishment of "white ways." The work of so-called improvement districts may be made valuable if regulated under a general improvement plan, but without centralized control the result is haphazard patchwork. A scientifically derived, comprehensive, and far-sighted street-lighting plan correlated with a city zoning plan is not easily worked out, but it is worth the effort.

Good street lighting presents to the entire public very conspicuous and easily understood evidence of the administration's good works in the community, and we now have a well-cultivated taste for civic beauty. In street lighting, as in many other works, we have had too much temporary construction instead of planning for the required flexibility along with permanence.

There are a great many ornamental and permanent street-lighting installations to be designed and built. They can be made to express art and the master's stroke in works of permanence. The present trend is not only for more adequate street lighting but for comprehensive advanced planning and for construction of a type which in a measure parallels the cathedral in both art and permanence.

ACKNOWLEDGMENT.—From a paper presented at the 31st annual convention of the American Society for Municipal Improvements.

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Forward Steps in Municipal Affairs

Lower Taxes and Better Service Under Manager Plan in a Vermont Town of 7,000

SPRINGFIELD, VT.—This was the first town in Vermont and the fourth in all New England to adopt the manager form of government. The new plan was adopted in June, 1920. Like many another community, our debt statement had been increasing rapidly, for no legitimate reason. Overdrafts were numerous and sizable. Springfield business men realized that some change was necessary and, with this end in view, they undertook the usual hard fight to bring about such a change. Very much of Springfield's success has been due to the untiring effort and generous support of her citizens. The six men on our two managing Boards have firmly and courageously supported the system since its adoption. While the tax reductions have been very welcome, we place rather more emphasis upon service rendered.

In 1921, the combined tax rate of both the town and the village of Springfield was $38.50 per thousand. By 1925 this rate had dropped to $31.40 per thousand, the assessed valuation for that year being $8,685,343. Of the total tax assessed in the town for 1925, 98.9 per cent was voluntarily paid to the Treasurer on or before the date due. The record of tax collection in the village was still better—99.4 per cent of the total assessment being paid to the Treasurer.

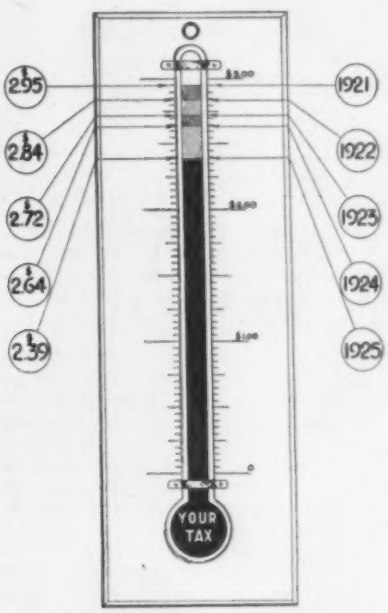
In Springfield, there is no direct charge to abutting owners for permanent improvements made; in other words, these rates cover everything and there are no assessments of any nature whatever. The citizens of Springfield, we believe, would not hestitate to say that they actually received full value from these taxes. It is very doubtful if during the years immediately preceding they received more than two-thirds value, dollar for dollar, in taxes paid.

Springfield's present population of about 7,000 is probably quite as large as during the year 1920, and never, during our entire history, have we accomplished so much permanent work. In our annual report for the year ending February 1, 1926, outstanding accomplishments under the manager plan were summarized as shown in the accompanying "box."

During the first two years and a half of our operations, Springfield was very ably served by Manager John B. Wright. Mr. Wright was a man of real executive ability and administered the duties of his office in a very capable and fearless manner. During this period, and for some years previous, the writer had been Treasurer of both town and village. Upon Mr. Wright's retirement from office, both the Manager's duties and those of Treasurer were placed in the hands of one man.

All of our municipal activities are to-day centered in one office, with one executive head and the necessary assistants to carry on the work in a businesslike manner.

Since Springfield adopted this system, St. Albans and St. Johnsbury, Vt., have both joined the ranks and are making good progress. During the past month, Windsor has adopted the system; Bellows Falls and Ludlow have carried the article success-



GRAPHS USED IN THE ANNUAL REPORT OF THE TOWN OF SPRINGFIELD, VERMONT, FOR THE YEAR ENDING FEB. 1, 1926

fully through their town meetings, and it is expected such action will be ratified at annual village meetings soon to be held in these two towns.

The last three towns are within a radius of forty miles from Springfield, and the recent action of their voters must be more or less attributable to the progress made in Springfield under this form of government. Two other nearby towns, Brattleboro, Vt., and Lebanon, N. H., are very much absorbed at the present in the study of this form of government.

The town and village closed their books this year with a total balance of cash on hand to the amount of $40,540.15.

R. M. WILCOMB,
Municipal Manager and Treasurer.

Know Your Town—Its Government and Accomplishments

Manager plan in operation—June, 1920.
New Summer Street school building, 1920—$85,000.
Peak of indebtedness, school bonds included, 1921—$232,508.68.
Floating indebtedness, bonded December, 1921—$120,000.
These bonds sold at a premium of $2,899.20.
Of this issue, $24,000 has been paid.
Total bond payment, past five years—$76,700.
A reduction of more than $3,000 in annual interest charges.
Total present indebtedness—$155,808.68.
Average cash balance for the past five years—$29,341.
Average cash balance, previous five years—$4,534.
Contribution to hospital and library, past five years—$38,000.
Contribution to hospital and library, previous five years—$13,767.65.
Town debt increased January 1, 1916, to February 1, 1921—$136,990.
Of this increase, $85,000 legitimate bond issue—$51,990 overdrafts.
Town debt decreased February 1, 1921, to February 1, 1926—$76,700.
Never an overdraft in any department during past five years.
Average Grand List, past five years—$82,959.54.
Average Grand List, previous five years—$63,225.75.
Average tax rate, past five years—$2.71.
Average tax rate, previous five years—$2.24.
Tax rate increase in comparison two five-year periods—21 per cent.
Tax rate 1921—$2.95. Tax rate 1925—$2.39.
Decrease during past five years—19 per cent.

FROM THE SIXTH ANNUAL REPORT UNDER THE MANAGER PLAN OF GOVERNMENT IN SPRINGFIELD, VT.

(Editorial Note.—The "Grand List" in Vermont represents one per cent of the total assessed valuation.)

New Union Market and Garage a Profitable Municipal Investment

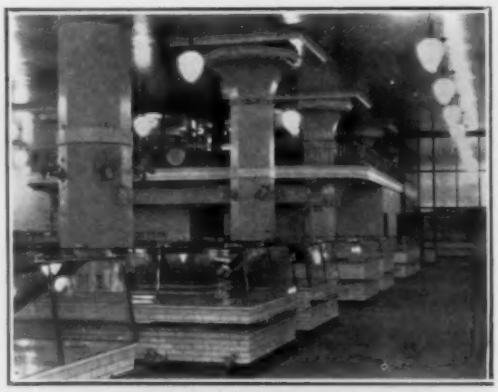
ST. LOUIS, MO.—About two years ago the people of this city voted bonds to the extent of $87,000,000 to make certain much-needed municipal improvements. One of the items in the bond issue was a new union market, for which $1,000,000 was set aside. This was to be erected on a lot owned by the city within a block or two of the main business district, and one already occupied by a retail city market building built about sixty years ago.

Because of the high value of the land and the great need of parking space in the down-town district, the city authorities decided to add to this building three floors for the parking of automobiles, and to provide out of municipal revenue the additional money required. This building has been completed and in operation for several months, and contains a number of rather novel features.

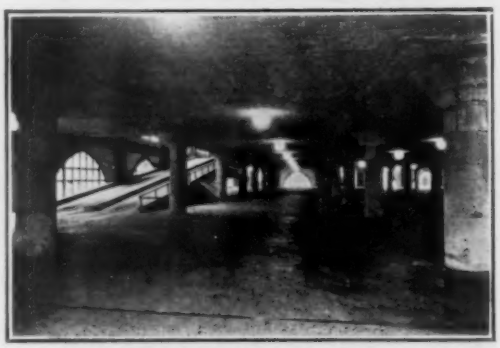
The new Union Market and Garage Building is about 196 feet wide by 270 feet long and occupies a complete city block. It is four stories in height and has a basement. The entire first story is used for the market proper, with public entrances from three of the adjacent streets. It contains on this floor a general market room, a fish market, and a restaurant. Over the ramp leading to the basement, a mezzanine floor has been built in this market story, providing office space for the Market Master, and a rest room and other facilities for patrons of the market. A balcony surrounds the mezzanine floor, on which band concerts are held at least once a week.

The market stalls are arranged in the usual manner, but all the usual overhead iron racks for hanging goods and suspending the lamps for showcase lighting have been dispensed with. This has been done by putting the butchers and poultry men, who alone require such racks, along the outside walls, where provisions for the hanging of goods can be made without obstructing a view of the market and where small refrigerating rooms can be provided for holding a reserve supply of perishable foodstuffs.

The lighting of the show-cases without the overhead racks was quite a problem. Along the tops of the glass partition, tubular lighting globes were placed parallel with the brackets that support the glass, and these in turn were housed in polished shields of nickel silver, so that the light would be



MARKET STALLS IN THE ST. LOUIS UNION MARKET AND GARAGE



STORAGE PLACE FOR AUTOMOBILES IN THE UNION MARKET AND GARAGE

UNION MARKET AND GARAGE, ST. LOUIS

hid from the view of the customer and reflected down into the show-case. The wiring for these lamps was brought along the edges of the glass in close-fitting channels of nickel silver, which also act as a protector to the exposed edges of the glass.

The fish market is separated from the general market room by glass partitions set in steel frames. Openings without doors lead into the fish market, and the whole market is ventilated through the fish market, so that no fish odors may come back into the general market room. The fish are displayed on cracked ice on solid porcelain trays which are insulated with cork. Special cutting boards are provided and so shaped that no water may get onto the floor.

The entire market has a terrazzo floor, but the stalls in which the sales people work have wood block floors, which are much easier to stand upon. Each stall or unit also has a lavatory with hot and cold water, oscillating fans, power circuits, and provision for telephones.

About one-third of the basement area is used for refrigerating rooms, where supplies of meat, vegetables, and fish are stored. Another one-third of the basement was intended to be used for a storage place for trucks for the adjacent wholesale houses, but will probably be used for a uniform terminal for about twenty-two bus lines that run between St. Louis and other cities. One of the largest public comfort stations in the city is built under the sidewalks in the basement story, and access to it is had from the street and from the proposed bus terminal.

The three upper floors of the building are operated twelve hours a day as a public garage for the storage of automobiles. This garage is open from 7 A. M. until 7 P. M. The charge is 15 cents for the first two hours, and 10 cents per hour thereafter, or 35 cents for a twelve-hour day. The actual storage capacity is about 600 cars, but because of the turnover occasioned by the storage of cars for short periods of time, more than 1,500 cars a day have been handled on the three floors. The use of this garage has exceeded all expectations, and receipts from it will average more than $200 per day throughout the year. Each floor of the garage is equipped with tire-inflating equipment and wash-room, toilet-room, etc. These floors are served both by elevators and by stairs.

The total cost to the city for the market and garage building was $1,275,000, and the land is valued at about $750,000. The total gross returns to the city for the entire building will be about $200,000 per year, or about 10 per cent on the total value of the investment. As the bonds for $1,000,000 of the cost of the building were sold at a premium of about $18, and bear 4½ per cent interest, the returns from the building will probably pay both the interest and the sinking funds of the bonds.

L. R. BOWEN,
Chief Engineer, Department of Bridges and Buildings.

New City Hall Hospital, Aviation Field and Other Improvements

ST. JOSEPH, MO.—This city, with a population of about 100,000 within its community area, has during the last two years undertaken and largely completed a far greater amount of public improvement work than in any like number of years in her history. These achievements really mark the beginning of a new era of beautification, progress, and improvement for this city upon the banks of the Missouri River, where Joseph Robidoux landed just one hundred years ago.

During 1924 and 1925 St. Joseph has completed a municipal golf-links of eighteen holes on a field of 120 acres, two swimming pools, a fine 10-acre free auto tourist camp, and an aviation field of 140 acres with hangers, which is believed to be the finest aviation field in the land with a hydroplane landing and the first municipally owned aviation field in the United States.

Within the last year the city has acquired and paid for over 600 acres of park ground and parkway at a cost of $1,000,000 dollars for the ground alone, and added this to the former boulevard and

The City Hall in St. Joseph will be a monumental structure, built of selected limestone, and designed by, and erected under, the supervision of the St. Joseph firm of architects, Eckel, Aldrich and Eckel, with McKim, Mead and White, of New York, acting in an advisory capacity. The dimensions of the building are 78 by 196 feet. It will be three stories in height, besides the basement for storage and machinery purposes

park system. The park board, composed of Charles Nowland, Dr. J. M. Doyle, and Thomas L. Ritchey, is making rapid progress in supervising, with a corps of able assistants, the considerable task of landscaping, grading, and beautifying, preparing for the paving, and planning for the viaducts and other work on this project.

We have under contract and are now building a modern isolation hospital to cost $200,000; have just completed a new $150,000 concrete viaduct over the railroad tracks on one of our main thoroughfares; and have expended $750,000 on additional sewers. We have well under way, with a large force of men, the superstructure of our new $750,000 city hall, which we believe will combine beauty and practicability to an exceptional degree.

A further expenditure of several million dollars is contemplated for a civic center to surround the city hall and to be joined to our park and boulevard system. In addition to the list of public improvements either completed or under way, the city has done the largest amount of grading and paving of streets and alleys and building of district sewers ever accomplished in two years of the history of St. Joseph, and as a result the building of new and up-to-date homes is going on in every part of the city.

HENRY E. GROSSER,
Mayor.

The Isolation Hospital in St. Joseph was designed by Eugene R. Meier, architect, of that city. The administration department is placed at one end of the building, completely isolated from the patients' wards and service. It occupies portions of both floors and the basement, providing all that is needed for medical, surgical, and living accommodations for doctors, nurses, and help. There is also a small chapel in this part of the building

The remainder of the building is devoted to wards of two beds each, so divided that each floor can be separated into four separate units for the segregating of different diseases and still be served from the utility corridor which runs the entire length of the building on both sides. Through the center of the building in the patients' quarters there is an observation or visitors' corridor with entrance from the administration end, with plate glass sides sealed in metal frames, so that friends may visit patients without danger of contracting their diseases. Modern laundry and sterilizing equipment is provided and every convenience for suitable kitchen service and distribution of food

Swimming Pool Construction*

An Attempt to Combine the Maximum of Utility with Economical and Hygienic Construction

By W. C. Batchelor

THIS discussion will deal chiefly with the construction of an outdoor pool of reinforced concrete, designed especially to meet the demands of large attendance, and at the same time to provide amply for conducting, simultaneously, a number of forms of aquatic activity. While economy in construction and operation are given careful consideration, none of the sanitary features necessary in a modern pool are omitted.

The specifications here outlined were included in the design of a municipal pool for Fort Worth, Texas, to be built this year. Following are the main features and the reasons for including them:

1. Rectangular shape.

Advantages.—Uniform starts and turns for swimming events. Regulation field play for water polo, water basket-ball, etc.

2. Size 75 x 200 feet. The outstanding feature of this pool is large size, with the greater part comparatively shallow.

Advantages.—(a) Width, being a multiple of five, provides fifteen swimming lanes of regulation 5-foot width, but is still narrow enough to insure safety if the depths here given are used. A life-guard, stationed as designated, should reach, in 10 seconds, any point in that part of the pool which is 5 feet or more in depth.

(b) Length provides flying finish for all standard distances; 25- and 50-yard dashes are straightaway swims, the 100-yard requires but one turn, the 220- two turns, and the quarter-mile six turns.

(c) General size. A pool of this size, with the depths as indicated, solves the problem of conducting all the common forms of organized aquatic activity without interfering with the general use of the pool by those not enrolled in these organized groups.

3. Depths. Minimum depth of 3½ feet at each end gradually sloping to a depth of 5 feet at a distance of 75 feet from each end. Area 40 x 50 feet at one side of the remaining 50-foot section with sharp slope from depth of 5 feet to maximum depth of 10 feet at sump 17½ feet from edge. Gradual slope from 4½-foot depth at opposite side of pool to 5-foot depth at edge of this 40 x 50-foot deep area.

Advantages.—(a) 87 per cent of pool area is between 3½ and 5 feet in depth and thus available for non-swimmers, beginners, and fair swimmers. Experience has shown the remaining 13 per cent to be adequate for diving and for expert swimmers, since swimmers find the shallower depths, up to 3½ feet, no disadvantage. In the old-style pool, with 70 per cent or more of the area more than 5 feet in depth, 75 per cent or more of those in attendance will usually be found in the shallower depths, which constitute less than 30 per cent of the pool area.

(b) Area at one end, 50 x 75 feet, with depth from 3½ to 4½ feet (considered ideal depth for instruction and for beginners) will accommodate a class of maximum size (100 or more). An area of equal size and depth is available at the opposite end for free use. An area 50 x 75 feet, that is, one-half of the remaining center section, which is 100 x 75 feet, is sufficient for water polo or water basket-ball (played across pool), while the other half of this section is available for the free use of swimmers and divers. A class in life-saving or the coaching of a swimming team could also be conducted and still provide ample opportunity for free use of this section of the pool.

(c) 3½-foot depth at ends is accepted by the A. A. U., the N. C. A. and the N. A. A. F. as sufficient for swimming starts and turns.

(d) The 5-foot maximum depth at any edge makes it impossible for a person to enter deep water except from springboards, but still gives sufficient depth for diving from edge.

(e) The deep area is sufficient to accommodate divers from the four springboards and diving tower. Except for the purpose of diving, a few aquatic games and practice in life-saving, deep water has little utility, and, when sufficient areas at depths less than 5 feet are provided, is used very little.

(f) Except in depths greater than 5 feet, slope of bottom is nowhere more than 2 per cent, thus eliminating all cause for slipping from this source. This slope is still sufficient to afford good drainage in cleaning bottom of pool.

(g) With the entire area, 15,000 square feet, deep enough for swimming, and 87 per cent of it less than 5 feet in depth, the maximum of utility in proportion to water volume is secured. For example, to summarize the foregoing detail, a large class in swimming instruction, a game of water polo or water basket-ball, the coaching of a swimming team and a class in life-saving might be in progress simultaneously, with nearly half of the pool still available for free use by non-swimmers, swimmers, and divers; the depths of this remaining area being in such proportions as experience has shown to be most advisable.

4. Depths marked with 10-inch numerals of brass or mosaic tile at 12 points on edge of runway surrounding pool.

Advantages.—Shallow depth of greater area of pool makes it more important to place depth markings so as to be readily seen by persons approaching pool than in edge above scum gutter for information of those in the water, as is customary in the old-style pool.

5. On diving tower which is located adjacent to deep area, sign is placed reading as follows: "17½ feet from edge of pool opposite tower, water is 10 feet deep." At foot of each low springboard is sign reading, "Two feet from end of springboard water is 7 feet deep." At each high springboard, sign reads, "Five feet from end of springboard water is 8 feet deep."

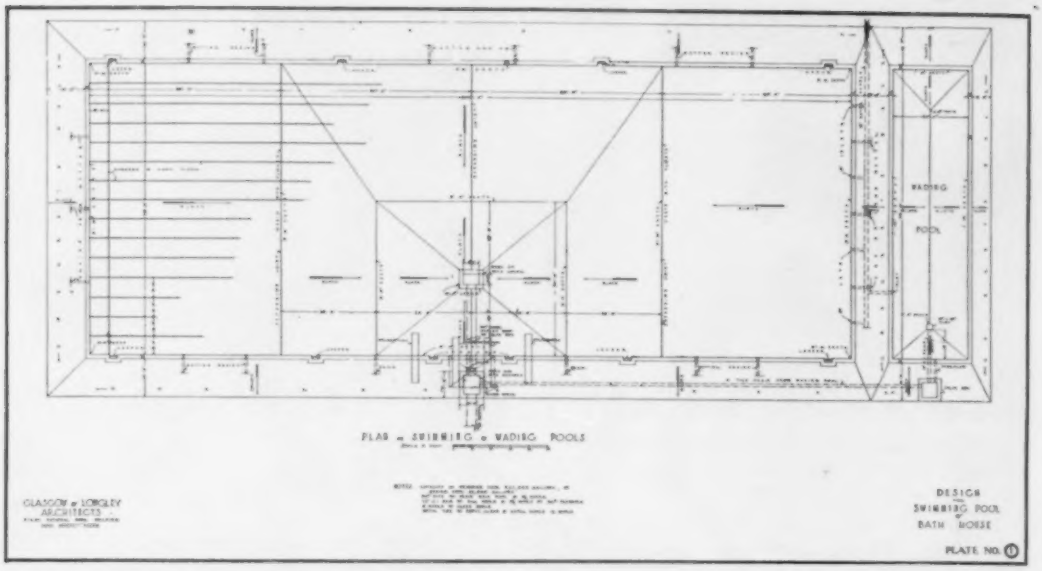
Advantages.—With depth from edge varying, these signs, together with depth markings on edge, give adequate warning to all divers. Simultaneously with the ability to dive from various heights, the diver develops the ability to govern, within certain limits, the depth to which he will dive. Thus, by giving the diver accurate information on depth, reasonable safety is asssured.

6. Lines running entire length of pool at 5-foot intervals across pool. These lines are 4 inches wide and start at upper edge of side of pool, continue to bottom, and end at edge at opposite end of pool. Lines on bottom to be of asphaltum set 2 inches in the concrete.

Advantages.—This is the standard method of minimizing interference in swimming races. The presence of lines is an incentive for swimmers to practice keeping eyes open under water and swimming in lanes or on lines. Asphaltum insures permanency. Painted lines, while not permanent, would effect a saving of $300.

7. Lines across bottom of pool 5 feet from each end. No other cross-lines.

*Copyright, 1926, by W. C. Batchelor. Drawings copyright, 1926, by Glasgow & Longley.



Advantages.—These act as a warning to swimmers approaching end of pool. Absence of other lines avoids the confusion caused when lines on bottom are used to mark distances.

8. Continuous scum gutter around entire pool, recessed in wall. Gutter to be broad and deep, and cross-section a continuous curve. (Plate II.)

Advantages.—Gutter around entire pool gives maximum of surface sanitation and provides hand-rail at all points. Contention that scum gutter at ends is source of danger to swimmers in competition has not found substantiation in the experience of many. Broad, deep gutter prevents back splash into pool, and continuous curve facilitates cleaning.

9. All ladders at sides of pool.

Advantage.—Leaves ends unobstructed for swimming competition.

10. Ladders recessed flush with side of pool.

Advantage.—Eliminates all danger to swimmers from this source, and entire fifteen lanes are clear of obstructions.

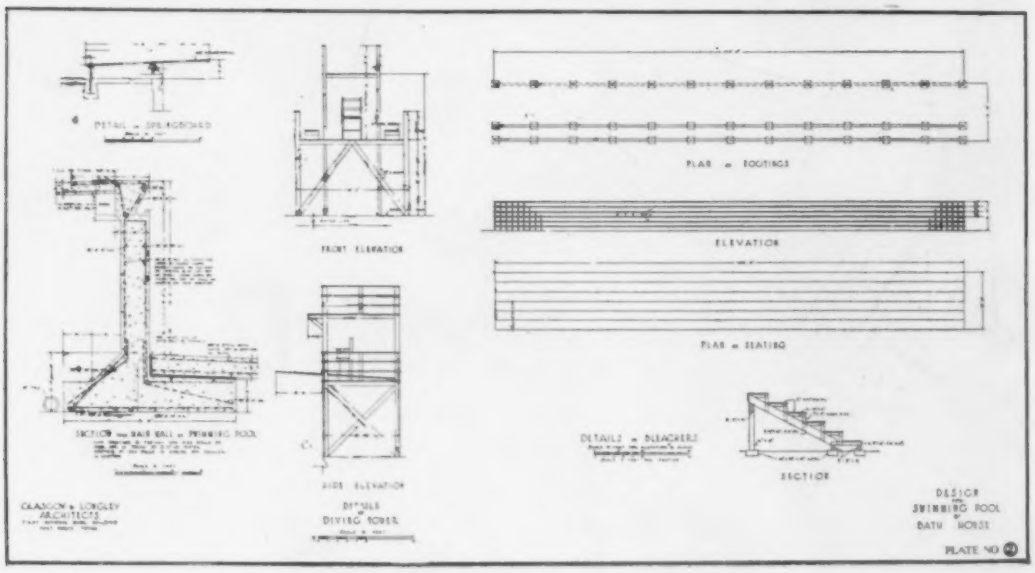
11. Flat treads for all ladders.

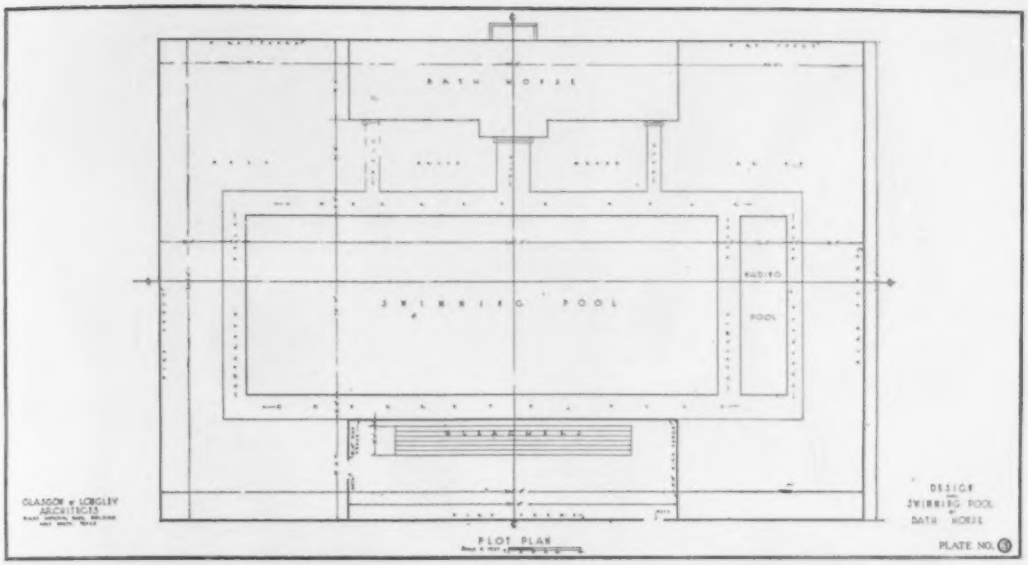
Advantage.—Reduces to minimum danger of slipping. Ladder with round tread, even though pipe is of large diameter, is dangerous.

12. Four springboards, two 3 feet from surface of water (edge of scum gutter) and two 10 feet, and diving tower with platform 16 feet from water, meeting as far as possible all requirements of N.C.A., A.A.U., and N.A.A.F., centralized at deep area extending 50 feet at one side of pool midway of length. (See Plate I for location.)

Advantages.—Provides regulation equipment for all swimming meets. Concentration of springboards at one point in a large pool is an advantage from the point of view of supervision and safety. This arrangement also minimizes the danger of divers striking swimmers, the latter being free from this form of interference except at this one location. This concentration, however, must not approach the point of congestion. The proper location of ladders is important in avoiding this danger.

13. Diving tower 8 x 12 feet with platform





9 feet from water, providing station for lifeguard as well as base for two springboards (10 feet height), and second platform 6 x 8 feet, 16 feet from water, water-proofed.

Advantages.—Places life-guard in most advantageous position to observe deep area of pool as well as to supervise diving. Second platform affords some protection from sun.

14. Bronze chain supported by wooden floats suspended across pool 50 feet from each end at depth of 4½ feet.

Advantages.—Chain is superior to rope, which very soon becomes slimy and rots. Bronze chain is recommended for the purpose of permanency, but galvanized chain is quoted in the estimates submitted herewith.

15. Thirty-inch concrete drain and 12-inch supply. Local conditions must be considered in deciding on size of drain and supply pipes. Former should take available sewer connections into consideration, and latter is dependent on available water pressure and size of supply main.

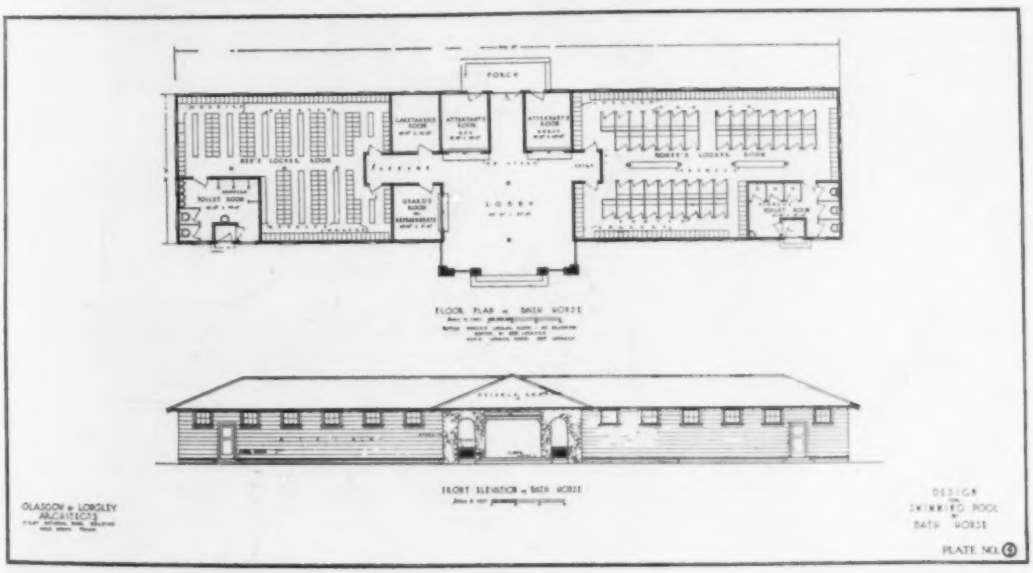
Advantages.—If local conditions allow drain and supply pipes of sizes indicated, this makes possible emptying the pool in 3½ hours and refilling in an equal length of time, with supply at 30 pounds pressure. Allowing 5 hours for cleaning pool, water can thus be changed in 12 hours.

16. Intake distributed at four points at one end of pool.

Advantages.—High pressure of large main is thus reduced before entering pool, minimizing erosion. If purity of water is maintained by continuous flow method, stirring up of sediment on bottom is reduced to minimum.

17. Concrete runway 10 feet wide entirely around pool sloping away from the edge at pitch of ¾-inch in one foot.

Advantages.—Wide concrete runway reduces dirt and other impurities carried into pool. Slope prevents water from draining back into pool, especially when cleaning runway. This slope obviates necessity of raised edge around pool advocated by some, which has several disadvantages.



18. Separate pool 20 x 75 feet with water depth of 1 foot 6 inches at edges and sloping to 2 feet at center.

Advantages.—Provides swimming and wading pool for children, under eight years in particular, who will probably be brought by parents. Aside from greater safety, this obviates necessity of depths of less than 3½ feet in main pool, which is considered minimum depth for practical swimming purposes for adults.

19. Rough finish for runway and bottom of children's pool.

Advantages.—Prevents slipping and is still capable of being cleaned by ordinary pressure from hose nozzle combined with scrubbing as conditions require.

20. Six-tier bleachers, 100 feet long, midway along side of pool opposite diving tower and bath-house.

Advantages.—Adequate provision for spectators popularizes swimming as a sport and may be a source of revenue. Location suggested gives all spectators unrestricted view of all aquatic events.

21. Pools, bath-house, and bleachers located on 200 x 300-foot area, and all unoccupied area grassed.

Advantages.—Provides area for active recreation while out of water and is a stimulus toward inducing people to spend more time exposed to the sun. For this purpose grass is superior to sand, the chief advantage of the latter being its association with a natural beach. Since the advantage is slight, while there are several disadvantages, sanded areas in connection with a pool of this type are not recommended.

22. Eight-foot chain link wire fence enclosing the whole.

Advantages.—Limits use of pool to those authorized. Limits persons in bathing suits to immediate vicinity of pool. Provides absolute control in the collection of fees where desired.

23. Separate entrance for spectators and 3-foot chain link wire fence separating them from swimmers.

Advantages.—Avoids dirt from shoes being carried into pool as a result of spectators on runway. Simplifies admitting spectators at lower fee than swimmers.

24. Pool designed to maintain hygenic condition of water by combination of "fill and draw" and "continuous flow" methods. Pool to be refilled weekly and splash replaced daily.

Advantages.—Fill and draw method gives opportunity to clean inside of pool at frequent intervals. Size of drain and supply pipes incurs no loss of time in use of pool. An average daily attendance of 1,500 in this pool, having a capacity of approximately 525,000 gallons, would keep the "weekly bathing load" below 20, which is considered to be within the range of safety. (This term is defined as follows: "The weekly bathing load is the number of bathers during the week, divided by the capacity of the pool in thousands of gallons.") By replacing the splash with fresh water daily, the purity of the water would be increased or a proportionately larger number (20 for every 1,000 gallons added) could make use of the pool without exceeding the suggested maximum weekly bathing load of 20.

Maintaining 3 parts per million of chlorine in the water would provide additional safety. If cost of water is so high as to compensate for the installation and operation of a filtration plant, recirculation might be considered. In case this were done, three 84-inch pressure filters, each with the usual capacity of 115.4 gallons per minute, would filter an amount of water equal to the total volume of this pool in approximately 24 hours.

25. Bath-house provides for collection of fees, supplying of towel, suit, locker key, etc., by one attendant for men and one for women.

Advantages.—This arrangement makes possible operation with a minimum of supervision, which can be further reduced during hours when smaller numbers are in attendance. Arrangement of exits from locker rooms makes possible collection of towel, suit, and key by same attendant by which distributed, when desired.

26. A locker is provided for each bather, a common dressing-room for men, and booths for women; 494 lockers for men and 258 lockers and 44 booths for women insure sufficient dressing facilities for maximum use of pool. However, it may be necessary at times to assign more than one person to a locker or dressing-room.

Advantages.—The individual locker is recommended in preference to the basket system. The latter necessitates more help, and even then does not permit of handling large groups rapidly, since each basket must be handled four times for each bather.

27. All bathers must pass showers and toilets from locker room to pool.

Advantages.—Added incentive to their use. Experience has shown that, even though notices are displayed drawing attention to the use of showers and toilets before entering pool, and in addition an attendant is provided to enforce this regulation, the added suggestion of the immediate presence of these facilities, conveniently located, is one of the most necessary factors in maintaining hygenic conditions.

28. Three inches of water in vestibule at entrance from pool to locker room.

Advantages.—Feet of all bathers are thus rinsed upon entering and leaving locker room. Particularly valuable where area around pool is not completely turfed. None but bathers may enter locker room from pool. None but bathers may enter the pool enclosure. These basins are not unsanitary if properly cared for.

29. Bath-house of stained shingles with rough-stone porch columns; fence and grounds as well pleasing to the eye.

Advantages.—A swimming pool may be a beauty spot, and being such is an added incentive to patrons to maintain hygienic and sanitary conditions. Tapestry brick is conceded to be one of the most attractive of materials for a bath-house, but the above is suggested as one of the most attractive of frame structures.

Construction Costs

Construction costs for a pool embodying the foregoing specifications, based on estimates secured in Fort Worth, Texas, in 1925, follow:

Swimming and wading pools:		
Excavation	$ 3,400.00	
Grading for floors	423.00	
Concrete work	7,000.00	
Sidewalks	1,569.00	
Forms	1,450.00	
Reinforcing	2,700.00	
Tile drains	400.00	
Concrete pipe	300.00	
Sumps	300.00	
Springboards	200.00	
Asphalt markings	350.00	
Water-supplies	1,000.00	
Ladders and galvanized chains	300.00	
Diving tower	300.00	
Miscellaneous iron	350.00	
Total	$20,042.00	$20,042.00
Bleachers		450.00
Bath-house:		
Foundations	$ 500.00	
Concrete floors	800.00	
Shingle roof	450.00	
Framing and finish	2,700.00	
Miscellaneous	500.00	
Stone porch	600.00	
Windows	600.00	
Plumbing	1,500.00	
Electrical work	500.00	
Painting	2,000.00	
Fence	1,000.00	
Total	$11,150.00	$11,150.00
Total cost of project		$31,642.00

While the features described in this article are adapted to an outdoor pool of the particular size stipulated, many of them are adaptable to an indoor pool or to one of smaller dimensions.

Complete plans and specifications for this pool may be secured for a nominal sum from Glasgow & Longley, architects, First National Bank Building, Fort Worth, Texas, or from W. C. Batchelor, Superintendent of Recreation, Pittsburgh, Pa., 518 City-County Building.

Public Swimming and Wading Pools at Pontiac, Ill.

By Wesley Bintz

"THE erection of this pool was made possible by Harriet Humiston, who by her will created 'The Apollos Camp and Bennet Humiston Trust,' for 'the inhabitants of the city of Pontiac and Pontiac Township,' one of its purposes being 'the improving, beautifying and equipping of parks and playgrounds.'"

This is the first paragraph of the memorial inscribed on a bronze plate on the front of the public swimming pool at Pontiac, Ill. The citizens of Pontiac (1920 population, 6.664) and Pontiac township are justly proud of the pool, which is believed to be the finest of its size in the Central West. It is built above the ground and is what is commonly known as the Bintz type of pool.

A Bintz pool is much like an inverted straw hat resting on a table. The table represents the ground level. The pool is in the crown of the hat, and the bath room is under the rim of the hat. Fill up the crown with a filler until you get the proper depths of water, and you have the pool. Now, put a wall with plenty of windows and a few doors around and under the outside edge of the rim of the hat, to enclose the space under the rim, and you have the bath room. Now, put in four sets of stairways for bathers and spectators, men and women, so they can get from the bath room to the pool promenade, put a rail around and on top of the outside edge of the rim of the hat, and you'll have a Bintz swimming pool. The wall of the pool becomes one side of the bath room, and the wide concourse floor or deck around the pool becomes the ceiling to the bath room. This makes for a single, compact unit of construction, in place of the ordinary two structures in a sunken pool, namely, a pool and a bath-house.

At Pontiac the pool proper is an ovoid, 80 x 120 feet, with a capacity of 253,000 gallons. The outside dimensions of the structure are 113 x 173 feet. The bath room is a long room having a minimum width of 14 feet 3 inches and a length of practically 395 feet. It is of all-concrete construction and steel window sash, permitting of none of the rotting characteristic of ordinary bath-houses.

The pool proper varies in depth from 3 to 9 feet, having not less than 80 per cent of this water wadable depth, that is, not to exceed 5 feet in depth. The pool is practically 100 per cent swimmable, that is, of a sufficient depth

for swimming over the entire pool area. The ends of the pool are squared off to a width of 36 feet, forming a rectangular section in the pool 36 x 120 feet, which can be used to hold swimming or racing meets. A scum gutter is provided around the entire pool, the top of the lip being exactly 12 feet below the top of the surrounding deck. The pool proper is subdrained by having a complete 6-inch sewer and 4-inch drain tile drainage system as well as 6 inches of gravel underneath the pool floor. This subdrainage system is to provide safety against the action of frost, as well as an indication of any leakage in the pool. An expansion joint between the pool floor and the pool wall is provided by using an especially fluxed asphalt. The locker-room floor contains sixteen floor drains, with the floor sloping ⅛-inch per foot towards all drains, and finished to a smooth steel trowel finish. This allows for slushing-out with a hose and keeping the floor in clean condition. This floor is also subdrained with 4 inches of gravel and a complete drain tile system. All footings are carried 3 feet below the tops of all floors or ground, to insure them against frost action.

The pool proper contains the following equipment: ten 1½-inch pipe ladders for the bathers to use to get in and out of the pool; a 1½-inch galvanized pipe handrail around the entire pool just above the scum gutter; ten signs indicating the depth of the water; eleven high-dive boards, two adjustable springboards, two all-steel slides, an electrical fountain, outlet, drinking fountain, guardrope and floats to prevent people from swimming from the shallow into the deep water, 525 feet of two-line reinforced concrete railing around the outside of the promenade, seventeen reinforced concrete lighting standards with a 200-watt light on each standard, four 750-watt overhead lights for lighting the pool, and sixteen reinforced concrete benches (placed since the picture was taken) for the spectators.

The bath room contains a waiting-room, first aid room, attendant's room, women's locker-room, men's locker-room, four sets of toilets for men and women bathers and spectators, and an equipment room. There are twelve private showers for the women and sixteen for the men.

Filters, Chlorinators and Other Equipment

The equipment room contains two 96-inch Everson filters, one Paradon chlorinator, a valve nest of 6-inch and 8-inch pipe containing ten gate-valves; also a 5-h.p. electric pump and motor for recirculating the pool at a rate of 18,000 gallons per hour, equilibrium pit, and all electrical control.

The lighting system consists of 45 60-watt lights, 18 100-watt lights, 14 100-watt vapor-proof lights, 17 200-watt lights, as above noted, on lighting standards around the pool proper, and 4 750-watt overhead lights over the water as above noted.

Taking into consideration the fact that the pool is all reinforced concrete and fully subdrained with deep footings, and that the bath room has space equivalent to a building 30 x 200 feet of permanent construction, steel window sash, and subdrained, the price that Pontiac paid for this structure will be interesting. The pool and bath house complete, including all underground work, cost practically $24,000. The equipment of the pool proper cost practically $1,700, and the equipment in the bath room cost practically $19,000. This makes a total cost of about $44,700 for a permanent pool and permanent bath-house fully equipped throughout with especially developed high-class equipment for both pool and bath room.

In order to take care of the little children, a small wading pool has been built near one side of the pool, this wading pool being a 20 x 40-foot ellipse with an 8-foot walk around it, and two lighting standards on each end. It varies from 6 to 18 feet in depth, has a central system of overflow and control, is fully subdrained and reinforced, and is a wonderfully fine little adjunct to the swimming pool. This wading pool cost in the neighborhood of $2,200.

The pool was built by the Nelsen Concrete Culvert Company, of Pontiac, E. P. Shapland, Superintendent. All special and steel equipment for the pool was furnished by J. H. Carnine, of Indiapolis. The pool was designed and supervised by its inventor, W. Bintz, of Lansing, Mich.

The 1926 Municipal Index states that 281 of the 713 cities of at least 5,000 population that replied to a questionnaire on recreation facilities reported a total of 559 municipal swimming pools. A substantial increase in the number of such pools is expected within the next year or two, to meet the demand for facilities for swimming under safe and sanitary conditions.

The Test Road in St. Joseph County, Indiana

By A. C. Mangus
St. Joseph County Highway Superintendent

THE cost of maintenance and the useful life of a road improvement is a function of the volume of traffic, and hence, to draw a comparison, it is necessary to study the location of the improvement with respect to all possible traffic areas and routes. Highway freight traffic has become the deciding factor in determining the structure of a pavement, and hence the fact that the aforementioned road is a freight route must be taken into consideration in determining the kind of material to use in reconstruction.

With highway freight, the scenic beauty or historic interest of a route is of no importance. The minimum ton-mile cost of such transportation is the one consideration. So, to reduce the ton-mile cost, the first thought is the choice of routes as to distance. Distance in miles is weighed against ease of traction, and the route showing the minimum in the total will be chosen.

Permanence Only Relative

No highway improvement can be considered as permanent—forever enduring. The period of useful life of any highway improvement is limited. The time will come when the pavement must be reconstructed. This period of useful life may be longer, under like conditions, with one type of construction than with another. In any case the period of useful life is lengthened by careful attention to the maintenance of the improvement. By proper maintenance the day of reconstruction may be delayed and the period of useful life lengthened, permitting us to have the use of the pavement at a lesser cost per year by distributing the first cost over a greater number of years. The time will come, however, when the yearly cost of maintenance will be as great as the yearly cost of the added investment for reconstructing the improvement. Then reconstruction is advisable, even necessary.

It is agreed that highway freight and passenger transportation is already established between great commercial centers. Traffic from Chicago to Toledo, Cleveland, and Buffalo passes over the section of the Lincoln Highway west of South Bend, built in 1915-1916. Traffic from Detroit, Lansing, and Jackson enters South Bend over the Ear Trail and there converges with west-bound Lincoln highway traffic, and all passes over this particular section, again to separate at Rolling Prairie, a part taking the Dunes highway through Michigan City to Chicago, the remainder following the old route through Laporte and Valparaiso. This converging and separating of traffic at South Bend and Rolling Prairie is evidence in itself that this section carries the greatest amount of traffic of any section of the Lincoln Highway between Chicago and Toledo, hence the necessity of reconstruction.

In the spring and summer of 1925 this section began to deteriorate in alarming proportions. Steel in the expansion joints began to appear to such an extent that it became a menace to traffic. In a great many instances it was necessary to pull the steel out with trucks. This caused a spalling of the concrete from 6 inches to 3 feet, especially in that section that was installed during the adverse weather conditions of the winter of 1916. During the summer a force of from six to eight men were patching practically half of the time. It became apparent that the time had come when the cost of maintenance was greater than the added investment for reconstruction would be.

What material to use, what sort of top to put on this old pavement, became a mooted question. Material-men naturally recommended a top that would require material in which they were interested. Contractors favored that material that would require the use of their particular equipment in installing the pavement. This diversity of opinions and the fact that the state was building a concrete road on the Division Highway from South Bend to Rolling Prairie, thereby shortening the distance between these two points by two miles, and that the building of this road would have a tendency to divert the heavy traffic from the Lincoln Highway to this new route, led to the conclusion that a test road would be the logical way out of this difficulty.

The Test Road

Accordingly, the County Engineer was instructed by the Board of Commissioners to prepare plans and specifications for six different types of road—concrete, penetration, sheet asphalt, asphaltic concrete, Kentucky rock asphalt and emulsified asphalt. The contracts were let in August, and the last section was completed the middle of September, 1925.

The first section, of 5 inches reinforced concrete, was built by Reed and Sons, of Mishawaka, at a cost of $2,150.

The second section was of penetration rolled to 3 inches, built by the Highway Improvement Company, of South Bend, at a cost of $1,100.

The third section, sheet asphalt rolled to 3 inches, was built by the Williston Construction Company, of Chicago, at a cost of $1,570.

The fourth section, of Kentucky rock asphalt rolled to 2 inches, was built by the Willistin Construction Company, for $1,430.

The fifth section, of asphaltic concrete rolled to 2 inches, was built by the Highway Improvement Company at a cost of $1,400.

The sixth section, of emulsified asphalt rolled to 1 inch, was built by the Emulsified Asphalt Company, of Indianapolis, at a cost of $1,150. In mentioning cost, we refer to the contract price, each section being let by contract. The several sections were 500 feet in length each. In choosing a location, we took a section of highway that was devoid of cross and side roads, thus compelling traffic to traverse each and every section of the test road.

What the ultimate outcome will be, we are unable to say, as time is the essence of this project, and it alone will enable us to determine what type of reconstruction will be the best and most practical for future traffic on this particular road.

ACKNOWLEDGMENT.—From a paper read before the Twelfth Annual Road School, at Purdue University, Lafayette, Ind.

Tacoma's Municipal Power Projects

By Allan B. Crain

FOR months prior to Marcus Whitman's visit to Washington, D. C., in 1843, it was well understood in diplomatic circles that there were negotiations on foot to trade American interests in Oregon and Washington for the fisheries of Newfoundland. However, Whitman succeeded in convincing President Tyler and Secretary of State Daniel Webster of the great wealth of this western country, and in doing so, saved for future generations the greatest potential hydroelectric power in any state of the Union. In the state of Washington alone is 14.27 per cent of the nation's potential hydroelectric power. This great resource was bound to attract industry and commerce.

Since the '90's, many private corporations have begun the development of this "white coal," and their investments will run up to many millions of dollars. Tacoma was one of the first municipalities to enter this field. Citizens of Tacoma adventured in municipal ownership in the early '90's.

Tacoma is so situated that it can develop power without great expenditure, and the construction of its power projects and distributing system has been free from any costly blunders. This has resulted in the city's selling power at rates claimed to be the lowest in the nation. Although some may take exception to this claim, as it does not take into consideration the many variations in rate schedules, nevertheless there are good grounds for this statement.

First Development

The plant of a private corporation was acquired by Tacoma in 1893, and it was operated with indifferent success until 1909, when the voters adopted a plan for a hydroelectric plant on the Nisqually River at a cost of $2,500,000. This project, begun in 1910, was completed in 1912 and delivered 38,000 horse-power. Shortly after it was put into service, reductions were made in rates to consumers. A few years later, in 1915, a combination cooking and lighting rate was established to provide every family with current at five cents a kilowatt-hour for a certain minimum, and after that, one cent a kilowatt-hour. And the citizen heats his house for a half-cent a kilowatt-hour.

These rates, which Tacoma officials declare are the lowest rates for electric lighting and power in the nation, have resulted in the heating of thousands of homes in Tacoma by electricity, while cooking by electricity is done on a scale that is said to be without a duplicate in the United States. While city officials state that electricity at the present stage should be used only as an auxiliary for heating purposes, many homes and apartment houses depend on

electricity alone, and some small homes have been built minus the chimney.

Despite the low rate, the Nisqually plant has been a great success. Under the management of an elected Commissioner of Light and Water, it has steadily gained in earnings. In 1917 its annual surplus was $257,355; by 1920 it had risen to $626,490; it reached $763,331 in 1922, and the Commissioner announced that the net profits for 1925 were a little short of the million-dollar mark.

Expansion

The Nisqually plant was outgrown in 1923, and it was realized that much more power was necessary if the use of electricity for cooking and heating was to expand and the industrial requirements were to be met. With such a record, there was little opposition to the construction of another great plant to take care of the growing needs of the city. In that year residents of Tacoma voted bonds to construct a huge project in the Olympic Mountains.

The Nisqually plant was built on a river fed by the melting glaciers of Mount Tacoma (Rainier), and tributary streams. At certain seasons of the year when the water is low, Tacoma has been forced to buy power from private corporations. In looking for a site, one with a greater storage basin was sought. This has been secured in the new plant called the Cushman plant, built on the Skokomish River, flowing out of Lake Cushman, and fed by the heavy winter rains that fall in the Olympic Mountains.

One unit of the Cushman plant was put into operation in March. It will develop 50,000 horse-power, and will give Tacoma a total of 88,000 horse-power. Later another unit will be built and will utilize a second time the water used in the first unit, by means of a dam constructed lower down the river and a tunnel two miles to Hoods Canal, where another power-house will be built that will develop 90,000 horse-power. Together with a steam station with a capacity of 12,000 horse-power, which was constructed during the emergency period of 1922, the city will ultimately have available 190,000 horse-power at an investment of less than $10,000,000.

Engineers say that there are few projects in the nation which develop so much horse-power for so small an investment.

Features of the Cushman Plant

The Cushman hydroelectric project has created great interest among electrical engineers. One of the highest dams in the Northwest, 275 feet high, has been erected across the great canyon dug by the Skokomish River in the foot-hills of the Olympic Mountains in the course of centuries. The dam will impound 450,000 acre-feet of water and will create a great lake 300 feet deep, extending back nine miles from the dam, and will entirely obliterate the old Lake Cushman.

In carrying the power from the Cushman plant to Tacoma, it has been necessary to construct across an arm of Puget Sound the longest suspension cables in the world, 6,241 feet. Six separate cables are used in the span, each cable weighing 11 tons. They are suspended between towers on either side of the water that are 311 feet high.

The building of the Cushman plant will cost approximately $5,250,000. A bond issue of $4,000,000 was approved for the construction of the project. The difference between this amount and the expenditure will be cared for by the accumulated surplus of the Light Department. The bonds will be retired from the revenues of these plants.

Tacoma seems to be thoroughly converted to municipal ownership of its light and water systems. However, the city does not ascribe all of its achievements in the development of hydroelectric projects to successful management. It is fully aware of the gifts that Nature has bestowed at its very door and the cheapness with which power can be developed. It credits itself only with utilizing these God-given opportunities.

Ira S. Davisson is the Commissioner of Water and Light, and Llewellyn Evans is the Superintendent of the Department of Electric Works. In the construction of the Cushman plant, J. L. Stannard was Chief Engineer, and J. V. Gongwer, Construction Engineer.

A CITIZEN'S EDUCATIONAL CREED

I believe that education is the strong defense of a free nation, and that ignorance is a curse to any people. I believe that the free public school system of the United States is the best guarantee of the rights vouchsafed to us by the Constitution. I believe, further, that the public schools of the land are the cradle of our democracy, and that in the classrooms and upon the playgrounds, where the sons and daughters of the street sweeper and railroad magnate, of day laborer and multi-millionaire, meet upon an equal footing and stand upon their own individual merits, the lessons of democracy and fraternity are best taught. I believe that the hope of America is in her youth, and that the battle-ground of the world is the heart of the child, and that government fails at its source when it ceases to make ample provision for the development and nurture of its future citizens.

— Fred L. Shaw, Superintendent of Public Instruction of South Dakota.

Public Utilities

A New Department Conducted for THE AMERICAN CITY by Professional Members of the American Public Utilities Bureau, 50 Madison Ave., New York:

JOHN BAUER
Rates and Finance
J. C. BRACKENRIDGE
Railroads
BENJAMIN COHEN
Gas Investigations

WALTER JACKSON
Street Railway & Busses
GEORGE A. JOHNSON
Water-Supply and Sanitation

LAMAR LYNDON
Electric Light and Power
MANFRED K. TOEPPEN
Telephones
MARK WOLFF
Accounting

Announcement

IN this issue there is introduced into the pages of this publication a new department dealing with the public utliity problems of municipalities. Among municipal officials and civic organizations of cities, towns, and villages throughout the United States, the question of proper policies toward the public utilities serving their territory is becoming of constantly increasing importance. It is quite apparent that the welfare, growth, and prosperity of the communities are bound up with, and dependent upon, efficient service at reasonable rates of street and interurban railway, gas, electric, and water companies and, to a lesser extent, of the telephone companies. This is the primary cause for the present policy of regulation of these services by the various states.

Obviously, for the shaping of proper policies in their relations with these utilities public officers must have a familiarity not only with the local situation in their particular localities as to rates, service, and operation, but also with the principles underlying the theory of regulation and their application to particular cases. In addition, a broad knowledge of developments and improvements in the entire utility field is an aid to the formation of sound judgment and proper decisions in cases at hand.

To meet this situation, THE AMERICAN CITY has arranged with the American Public Utilities Bureau to conduct this new department of Public Utilities which will strive to make available to the readers of this magazine such material as will assist them to a better understanding of public utility problems and keep them informed as to important developments in this field. This material will be prepared by the specialists in the various branches of the field whose names are given in the department heading. There will be three general classes of data published:

1. A series of articles on the fundamental principles involved in regulation. Under this head there will be discussed such questions as the theory and purpose of regulation; present drift in regulation; methods of valuation; depreciation, the question of a separate allowance in the rate of return to be allowed utilities; and other similar or related problems.

2. A digest of important decisions by courts and commissions on regulatory matters. This will be limited to those having a general application and involving matters of policy or principle. Accompanying these there will be a short discussion and comment wherever pertinent.

3. Special articles on various public utility problems of general interest; also news items of development in the field.

It is hoped that this department will serve to acquaint our readers more fully with the utility problem and help toward establishing better relations between the public and the utilities through a better understanding of the conditions in the field. Comments and inquiries will be welcomed.

Trolley vs. Bus in New York

IT is a dull day that does not produce a new offer to the city of New York for the abolition of trolley cars and their replacement by motor-busses. However, there is a noticeable coyness with regard to a borough-wide 5-cent fare with free transfers. Indeed, no one has yet come forward with an offer to duplicate the longitudinal north-and-south trolley routes of Manhattan at a fare of 5 cents.

There are more or less tentative offers of a 5-cent fare for the shorter crosstown routes, but under these proposals it would seem that the north-and-south lines would be on the basis of 5 cents per zone. The revenue that would accrue to the city of New York from motor-bus operation is also left very hazy. It is to be borne in mind that the paving obligations of the street railways would not be taken over by their motor-bus successors, so that the city itself would have to assume this burden. The property taxes of a motor-bus system would also probably be less than those paid by the deceased street railways.

While, also, there is evident need for many bus routes to give short cuts in outlying districts of Brooklyn and Queens, the great struggle is for areas which have already been developed extensively via the trolley. Hence the natural and proper effort of Mayor Walker's administration to seek borough-wide bids, if possible.

One of the most interesting bids is that of the General Omnibus Corporation, holding-company for the Fifth Avenue Coach Company. This contemplates the setting up of a fund for amortizing abandoned trolley routes. Such a proposal does

not promise much for universal 5-cent fares. Considering these and other proposals, the Mayor might well study the experience of London, which has had, for a generation, a bus-tram argument still going strong. Watch your step, Father Knickerbocker.

The Federal Income Tax in Its Application to Public Utilities

ATTENTION has been frequently directed in recent reports by the heads of public utility corporations, to the heavy burden of taxation which such corporations have to bear. The comments thereon have been mainly of a plaintive sort, without any workable suggestion as to how the load might be lightened.

Under the present Federal income tax law, as well as that which it superseded, there is imposed on public utility corporations the same rate of taxes as on all other corporations—13 per cent in 1925, and 13½ per cent in 1926. A most important feature of the 1926 tax law, signed by the President in the latter part of February, is the elimination or reduction of many so-called "nuisance taxes," that is, taxes imposed directly on the sales of commodities or service. For example, taxes on automobiles were reduced from 5 to 3 per cent; on auto trucks they were abolished; taxes on cigars, jewelry, and admissions to amusements were greatly reduced. Yet nothing has been done, nor, in so far as press dispatches indicate, nothing even suggested, looking to the elimination or reduction of the Federal income taxes on public utility corporations, which under proper regulation are, after all, a direct levy on the consumer—collected in a way that does not reveal their true nature. The reason for this may be found in two factors, namely, ineffective regulation, and lack of understanding of the true effect of the tax.

If regulation of public utilties were carried out in accordance with true scientific and economic principles, the fixation of rates would become practically an automatic process. This can be achieved only by a definite determination of the valuation of the rate base, which would be constant irrespective of fluctuations of prices and would vary only with additions to take care of growth in business (and this would be at actual cost of installation). With such permanent rate base, courts and commissions would be relieved of the constant struggle with problems of valuation. They would then be enabled to concentrate on real regulative duties—improvements of service and lowering of costs and rates.

The Consumer as the Actual Taxpayer

Under that type of regulation it would become immediately apparent that the consumer and not the corporation actually pays the tax.

Let us see how this would work out. Public utilities should charge rates which are sufficient to pay the cost of giving the service and to yield a fair return on the investment devoted to the use of consumers—no more and no less. When costs decline, the commissions would order a corresponding reduction in rate; and when costs rise, an advance. Take the case of a gas company. Let us assume an investment per thousand cubic feet of gas sold, of, say, $5. A 7 per cent return thereon requires an income of 35 cents. If the cost of manufacture and distribution of gas without Federal income tax is 65 cents, then a fair rate to consumers is $1. But the company would not have 35 cents per thousand cubic feet of gas sold under that rate, for out of that amount there would have to be paid approximately 4 cents per thousand cubic feet in Federal income taxes. Since the rates would fluctuate with cost, the additional amount would have to be collected from consumers in increased rates.

For further proof of the fact that under proper regulation the Federal income tax is simply a form of direct levy, let us assume that the tax is abolished. There would then follow, in the case cited above, a reduction in cost to the corporation of 4 cents per thousand cubic feet of gas sold. The company, however, would not benefit thereby, for it would have to reduce its rates accordingly. The only ones benefited would be the consumers.

Commodity Prices Not Analagous

It may be argued that the same is true of the manufacturers of other commodities. That such is not the case will readily appear when we remember that for the ordinary commodities the price is determined by supply and demand and by competition. But in the case of public utilities the price is presumed to be kept in harmony with cost of service, so that the profits will at all times yield a fair return on investment. Any added expenses cannot be absorbed, as well may be the case with other commodities, in excessive profits. Such taxes must be passed on to the customers of public utility corporations; they are a direct levy, even though not directly assessed against each consumer.

The reason, probably, why there has not existed any general sentiment for the abolition of this tax on public utility corporations is because it is pretty generally felt that regulation has not achieved the purposes for which public utility commissions were created. Cost of service and rates have not been harmonized, in spite of twenty years of effort. Some companies have been making huge profits, and have not reduced rates. Others have not been able to obtain adequate and fair rates. In this situation the differentiation between a regulated utility and one not subject to regulation practically disappears, for there cannot be any regulation where there is no constant relation between the cost of furnishing service and the rates charged for such servce.

Public Utility News

Municipal Water System Reorganization

DENVER, COLO.—Denver water rentals are going to be raised. This information was given to Mayor Benjamin F. Stapleton as the first open move of the new municipal water board to reorganize the affairs of the municipal water system.

At the same time, the Board announced, in a formal statement to the Mayor, that bond issues to cover the cost of providing a new water-supply from the western slope must be adopted later. The Board has decided to acquire all necessary rights to obtain this water and to rent the Moffat water tunnel for its diversion, the letter to the Mayor set forth.

These announcements were made in a formal letter to the executive by the Board of Water Commissioners as a solution to what was characterized as an "unbalanced" situation now prevailing in the budget of the board.

Lower Rates for Electricity

DETROIT, MICH.—A voluntary reduction in the Detroit Edison rate that will mean a saving to the smallest domestic consumers of electricity of about $1.75 a year, was announced in a letter to Mayor John W. Smith from Alex Dow, President of the company.

The approval of the Michigan Public Utilities Commission has been asked.

OSSINING, N. Y.—In accordance with an announcement made by President Francis A. Stratton of the Northern Westchester Lighting Company, and other like utilities under his management throughout Westchester County, a reduction in electric lighting rates of one cent per kilowatt-hour will take effect in Ossining beginning March 1, under provisions of a new tariff filed voluntarily with the Public Service Commission and approved by that body.

WESTCHESTER COUNTY, N. Y.—Following a preliminary investigation of the electric rates of the Westchester Lighting Company by the American Public Utilities Bureau, the company announced a reducton of 8½ per cent in rates throughout the district served by it. The President of the company estimates a reduction of $385,000 per annum to consumers under the new rate, which went into effect on March 1. This reduction was made voluntarily by the company, without its acceptance, however, by the municipalities affected, which expect to continue the investigation and fight for still lower rates, pursuant to the advice of its experts.

To Encourage Industrial Use of Gas

OMAHA, NEBR.—A special rate to encourage use of gas for industrial purposes in Omaha, effective March 1, has been announced by T. A. Leisen, General Manager of the Metropolitan Utilities district. New rates for metered water were announced, also, but their application is said to make very little difference in the amount paid by the large majority of consumers.

"If the gas consumption can be materially increased through its use by industrial establishments at a low rate, which, however, must be compensatory, the ultimate result will be a general decrease in the cost per 1,000 cubic feet of all gas sent out," Leisen said.

Gas Rate Controversies

SAN FRANCISCO, CALIF.—San Francisco gas consumers will receive refunds amounting to nearly a million dollars on bills paid in 1914-15 and 1915-16 if a compromise between the city and the Pacific Gas & Electric Company, recommended by City Attorney John J. O'Toole, is accepted by the Board of Supervisors. The compromise would end ten years' litigation which has involved the expenditure of more than $80,000 in an effort to establish the right of the city of San Francisco to fix gas and electric rates, a function that has been taken over by the State Railroad Commission since the suit was instituted by the company.

Shortly after a court decision, the company offered a compromise to refund $989,500 to consumers and payment to the city of its litigation expenses, $31,000. It was this offer which O'Toole recommended to the Public Utilities Committee of the Board he accepted.

DAYTON, OHIO.—The Dayton Power & Light Company has petitioned for a 75-cent rate for natural gas. According to City Manager F. O. Eichelberger, the city of Dayton will insist upon a 60-cent rate, on the basis that the company will earn a fair return at this figure. An ordinance prescribing the 60-cent rate has just been passed by the City Commission. The company has until April 1 to protest to the Public Utilities Commission.

Telephone Rate Case

NEW YORK.—The Federal statutory court on March 10 denied the request of the New York Telephone Company to add 25 per cent, instead of the present 10 per cent, to New York City telephone bills, and to increase the upstate rate 18 per cent. The three Judges criticised the company's appeal to the Court for the additional rate raise when a decision by the Public Service Commission was imminent. The Court, however, made it clear that rates fixed by the Commission would not stand unless based on principles announced by the statutory court, which last year allowed a temporary 10 per cent increase. The hearings before the Public Service Commission were completed in February, so that a decision by the Public Service Commission is due shortly.

While the decision of the statutory court is being hailed by the city officials in New York as a great victory, the company, on the other hand, is also jubilant as evidenced by a statement to the effect that the New York Telephone Company has apparently been able to speed-up the decision by the Public Service Commission, as well as to have the Court serve notice that the principles governing the Commission's last rate decision would not be sustained on appeal. All in all, it would appear that, although a temporary victory for the city had been gained, it foreshadaws an ultimate victory for the company.

Whether the U. S. Supreme Court, on appeal, would support the lower Federal court in ruling that reproduction cost less depreciation is the dominant element in rate case ascertainment, is hardly likely, in view of that court's decision in the Georgia Railway case. The New York Commission allowed the telephone company a rate of return of 7 per cent; the Court suggests that 8 per cent should be allowed. The New York Commission excluded going-value, which omission the Court in its present opinion considers an error.

Rising Popularity of Motor-Bus

NEW JERSEY.—The rising tide of popularity of motor-bus transportation, is indicated by the large increase during 1925 in the number of such fares collected on the Public Service system in New Jersey. During 1924 the company carried only 50,197,849 bus passengers, while in 1925, the number increased to 141,144,699. On the other hand, the traffic on the street cars of the company decreased by 11,039,823 passengers carried in 1925, as compared with 1924.

MISSISSIPPI.—The Mississippi Power Company recently discontinued operation of street cars on the "American Riviera," and supplanted this service between Biloxi, Gulfport, and Pass Christian with very commodious busses. The construction of the 28-mile sea wall along the coast necessitated the tearing up of the company's tracks and, rather than restore them, the bus service was inaugurated. The company reports much increased traffic, due not only to the improved service, but also to the large increase of winter visitors this year.

Street Railway Franchises and Rates

ST. LOUIS, MO.—The ordinance under which the city adminstration proposes to have the new St. Louis public service company operate, after reorganization of the United Railways Company, will be made public soon. It will, it is understood, be patterned to a large extent after the Montreal ordinance, which regulates service at cost. Street railways and motor-busses operate there.

ALBANY, N. Y.—The cities in and around Albany, N. Y., have joined forces to bar an increase in car-fares proposed by the United Traction Company on all its lines.

Reduction on Water and Light Rates?

LEBANON, PA.—According to J. C. Moulder, City Light and Water Commissioner, a reduction of about 33 1/3 per cent in the present water rate and a decrease of about 20 per cent in present light and power rates, will be made around June of this year.

Appeals to Federal Courts

GENERAL.—Representative Bacharach has again introduced a bill in the House, under which appeals to the Federal courts from decisions of state utilities commissions would be forbidden until every remedy of appeal to the higher courts of the states has been exhausted. It is hoped that all states will urge their Washington senators and representatives to support this worthy measure. Governor Moore of New Jersey is a strong supporter of this bill.

Standard Traffic Signs for Pittsburgh

By Burton W. Marsh
Traffic Engineer, City of Pittsburgh

PITTSBURGH has long needed more and better signs to help the tourist through the city, to warn of dangerous points, and to indicate traffic regulations. In the traffic-signing of streets, the tremendous advantage of standardization of types of signs can be easily recognized, for it means that the driver will be able to recognize quickly by size, shape, color, and symbols on signs, as well as by the wording, just what the sign is for. With no standards for traffic signs, such signs as are painted or purchased are apt to be of various shapes and sizes, different color combinations, and various wordings.

For example, of several signs for the same general purpose, there may be as many different wordings as there are signs. This means that the motorist cannot come to recognize any such sign instantly but must carefully read each one if he is to find out what it is for. With standardized signs, the motorist comes to know that black letters on a yellow background are used for warning or cautionary purposes; that white letters on a red background are used only for "stop" signs; that diamond-shaped signs are decided danger warnings; and that octagonal-shaped signs are "stop" command signs. Moreover, in standardized signs, the wording is reduced to a minimum and is always the same. Furthermore, the use of symbols can be introduced in a uniform manner.

With these purposes in mind, the Bureau of Traffic Planning has, with the valuable assistance of the citizens' Better Traffic Committee, Professor Edmund M. Ashe of the Carnegie Institute of Technology, and others, developed designs for several standard signs for Pittsburgh. These are shown in the picture on page 431.

Color

Color is one of the most valuable ways of attracting attention in signs, and these signs are standardized in the color combinations as recommended by Secretary Hoover's National Conference on Street and Highway Safety, and other groups. They are as follows:

1. *White letters on a bright red background for "stop" signs.*—The "stop" sign for "through traffic" streets is an illustration. This sign is for use on side streets approaching important traffic arteries. A driver approaching a through traffic street would first see the large word "Stop." When he came close to the sign he would be able to read the other two words, which are in a much smaller sized letter, and he would find that the reason he was to stop was to give a superior right of way to "through traffic." It is now evident that this is not a confusing sign, whereas if all three words could be read at the same distance, the order of words used would be confusing. This order was used so that the important word "Stop" could be placed in the widest portion of the sign, and hence could be of the largest possible size.

2. *Black letters on a brilliant orange yellow background for cautionary and danger warning signs.*—The choice of this color combination is a most fortunate one, in that brilliant yellow attracts attention more effectively than almost any other color and also has the greatest carrying power of any single color except possibly orange. Also, black letters form a most excellent contrast on this yellow background. All the signs in the accompanying picture have this brilliant orange yellow background with black letters, except the "stop" sign already mentioned.

Wording on Signs

To make these signs as effective as possible, it is essential that there be the fewest possible number of words that will make the meaning of the sign clear. The use of short and common words is also important. Furthermore, the most essential word is emphasized by the size of the letter. Thus, it will be noted in the signs shown, that the maximum number of main words is four, and that five of the seven signs have only two main words upon them. The words "Pittsburgh D. P. S." were added in very small letters so that they would not detract from the main words on the sign. It was felt that this Department of Public Safety designation was advisable in order that there should be no question of the official character of the signs.

In designing these signs, the absolutely plain, medium-width stroke, "Commercial Gothic" or block letters used, were selected as the style best suited because they can be so easily and quickly read. Furthermore, a fair

amount of space is purposely left between letters, as this makes the word easy to read. It is believed that a letter of the proportion shown is more effective for traffic signs than a letter of the same width but twice the height.

Symbols

The use of symbols on traffic signs is of great value for several reasons:

1. Drivers who do not read English easily may study out the meaning of the sign when they first see it and thereafter recognize the sign not only by the shape and color, but especially by the *symbol*. Even if a driver could not read English at all (although such a driver should not have a license), the symbol in many cases would give him some idea of the warning indicated in the sign.

2. As soon as the average driver has seen these signs a few times, he will come to recognize each sign almost instantly by its shape and by the symbol upon it, and will not have to read the wording at all. This is of value in that the driver's attention is not taken away from the road for any appreciable time.

The symbols chosen for these signs were ones which, it was felt, had a direct relation to the purpose of the sign, and ones whose meaning would be promptly understood by the average driver. Thus, the meaning of the running child in the School and Play Zone signs should be recognized at once.

Similarly, in the "Quiet Zone" sign, although the picture does not show it, the cross is the well-known red cross which is customarily associated with nurses, hospitals, etc. In this one instance the spot of red color also serves to attract the eye to the sign, although it has the disadvantage of increasing the cost about 20 per cent. It is felt that this relatively small spot of red color does not constitute a serious conflict with the color-meanings (red-"stop") now being generally adopted in traffic.

Likewise, the automobile shown on the steep hill serves to emphasize the "Second Gear Hill" warning, although this symbol gets away somewhat from the essentials of boldness and simplicity. The very shape of the arrow "One-Way" sign is a symbol in itself.

Shape of Signs

The designs follow, in general, recent proposals of the Joint Board on Interstate Highways as to standardized shapes. According to sketches prepared for their report, a round shape is to be used exclusively for railroad crossing signs. The hexagonal shape is to be used exclusively for "Stop" signs, the diamond shape is to be used for danger warning signs, and the square for other cautionary signs.

It is proposed to follow these shape standards for Pittsburgh traffic signs, except that for economy, rectangles of one or two odd sizes will be used for certain signs, in place of the perfect square.

Other signs, such as warnings of bad curves and bad turns, will be added later, following the same design standards.

Size of Signs*

Not only are the signs standardized in color, shape and wording, but they are to be standardized as to size. The "Stop—Through Traffic Street" sign, "Second Gear Hill" sign, and the "Bad Crossing" sign under present plans all have a sign area of about three square feet. This equality of areas instead of equality of dimensions was used on the basis that the effectiveness of such signs depends largely upon the area of the brilliant-colored background and upon having a relatively small proportion of that area filled in with letters, symbols, etc., in a contrasting color.

The square and diamond-shaped signs are 20¼ inches square, and the width of the octagon sign is roughly 23¼ inches. The rectangular signs are to be approximately 19½ inches by 24 inches, this variation from the square being used in order to get the desired symbols and size of letters upon these two signs and yet to keep the cost down. The odd half-inches are used in order to have the areas of the pieces from which the signs are cut, come out in even quarters of square feet, as prices change by these units, at least, in a number of companies. The "One-Way" arrow is 36 inches in length.

Specifications for Signs

It is proposed to have these signs made up in vitreous porcelain enamel on 18-gage enameling iron stock. Porcelain enamel is chosen for the following reasons:

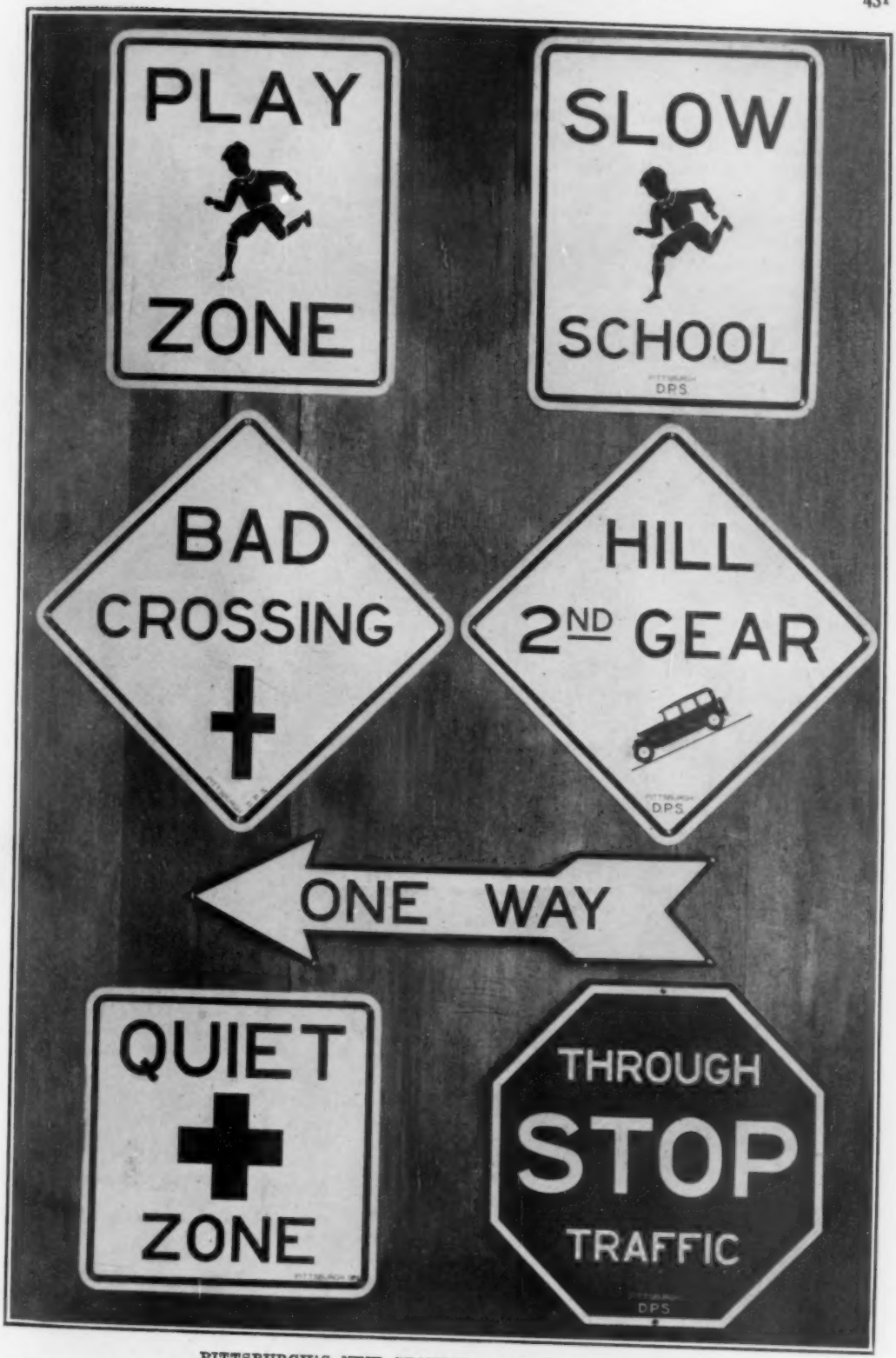
1. Maximum of effectiveness.
2. Will not catch dirt rapidly.
3. Easily and effectively cleaned.
4. Does not require repainting every year or two.

The disadvantages of the somewhat high first cost and the danger of being stoned and chipped have been taken into consideration.

Among other items in the specifications are:

1. Ten-year guarantee against fading, rusting, or tarnishing.
2. Full-sized color samples to be submitted with bids.
3. Two coats of each color to be applied sepa-

* On this matter, the final decision has not been made; somewhat smaller sizes are also being considered.



PITTSBURGH'S NEW STANDARDIZED TRAFFIC SIGNS

These signs have black letters on a brilliant orange-yellow background, except the "Stop" sign, which has white letters on a bright red background

rately over a substantial ground coat, and fired at not less than 1800° F.

Method of Putting Up Signs

In general, these signs will be attached to existing poles, but wherever necessary, separate posts will be installed for them. It is realized that a warning sign is of little value if it is ten or twelve feet up in the air; and it is quite well established that, in residential and outlying districts where parked vehicles can be kept from hiding the sign, the most important item of the sign should be about four feet above the road surface except where the sign extends over a sidewalk, when it is probably better, in order to avoid possible injury to pedestrians, to place the sign just above the height of a man's head. Where constant loading and unloading of merchandise goes on, and where there is considerable demand for parking space, it is also necessary to place the signs higher, although it is recognized that this is not generally desirable. Usually, however, in such locations, the speed of traffic is not great and signs placed higher are more apt to be seen.

Most of the signs indicated are to be placed just at the curbstone, but over the grass strip or sidewalk area and not over the roadway area, so that trucks and automobiles will not hit them in passing. The signs will be placed at an angle so as to be readily seen by approaching traffic and also so that they will be visible at night by the light reflected from the headlight of automobiles—a most important consideration.

In the case of the School sign, however, consideration is being given to the idea of erection upon a movable standard and having it placed either in the center of the roadway, or on the right-hand side, some few feet from the curb on wide streets. These signs would be placed about one hundred feet or so away from schools. This plan is proposed so that the warning to drivers will be of the greatest possible effectiveness. If this proposal is carried out, it will be on the basis of placing the signs on the road surface about one-half hour before school time and removing them after the children have gone home— in other words, giving warning only when necessary. It is realized that a number of such signs would be knocked over and damaged or broken, but it is felt that the added effectiveness should more than counterbalance such losses.

EDITORIAL NOTE.—For the results of later investigations, see page 447 of this issue.

Traffic-Sign Manufacturers Discuss Demonstration Installations

IN connection with the New York State Safety Congress, in Albany, March 11-13, an informal meeting was held of representatives of five manufacturers of traffic signals, the purpose being to secure a consensus of opinion regarding certain practices and sales methods.

The following subjects were discussed, and it was the unanimous opinion of all present that, if the suggestions offered were universally adopted by the trade, it would be in the interest of all concerned:

"1. There is an increasing demand on the part of municipalities that the signal manufacturer shall not only loan his apparatus for demonstrations but that he shall assume the full cost of installation and all charges incident thereto. It is our unanimous opinion that the manufacturer in furnishing the apparatus for a trial demonstration is fully cooperating with the prospective purchaser, and that the municipality should assume all expenses incident to the installation, operation, and all carrying charges.

"2. Inasmuch as there is a tendency on the part of municipalities to require a number of signals for demonstrating purpose, it is felt that an estimate of their value can be as fully obtained by a limited number of signals, having regard to the ultimate number to be installed, and it was considered that where the proposed installation did not exceed ten, no more than two intersections should be demonstrated; and in no case should more than three intersections be equipped for demonstration.

"3. Inasmuch as demonstrations in the past have been extended to unreasonable periods, it is felt that a full estimate of the value of signals can be obtained in sixty days and that this period be considered the limit of demonstration.

"4. Inasmuch as all manufacturers have from time to time been requested to provide security company bonds against damages arising out of patent litigation in connection with the Kelly patent, it was felt that no manufacturer should agree to supply to a municipality a bond or other guarantee than that of their own respective firms."

Those present at the meeting, all of whom agreed to the foregoing statement, were:

L. W. McOmber, representing Essco Manufacturing Company, Peoria, Ill.

H. B. Duggan, representing Crouse-Hinds Company, Syracuse, N. Y.

P. H. Senior, representing Horni Signal Manufacturing Company, Newark, N. J.

U. G. Kelley, representing Macknel Signal Corporation, Lancaster, N. Y.

E. M. Johnson, representing American Gas Accumulator Company, Elizabeth, N. J.

Chamber of Commerce Activities in Public Affairs

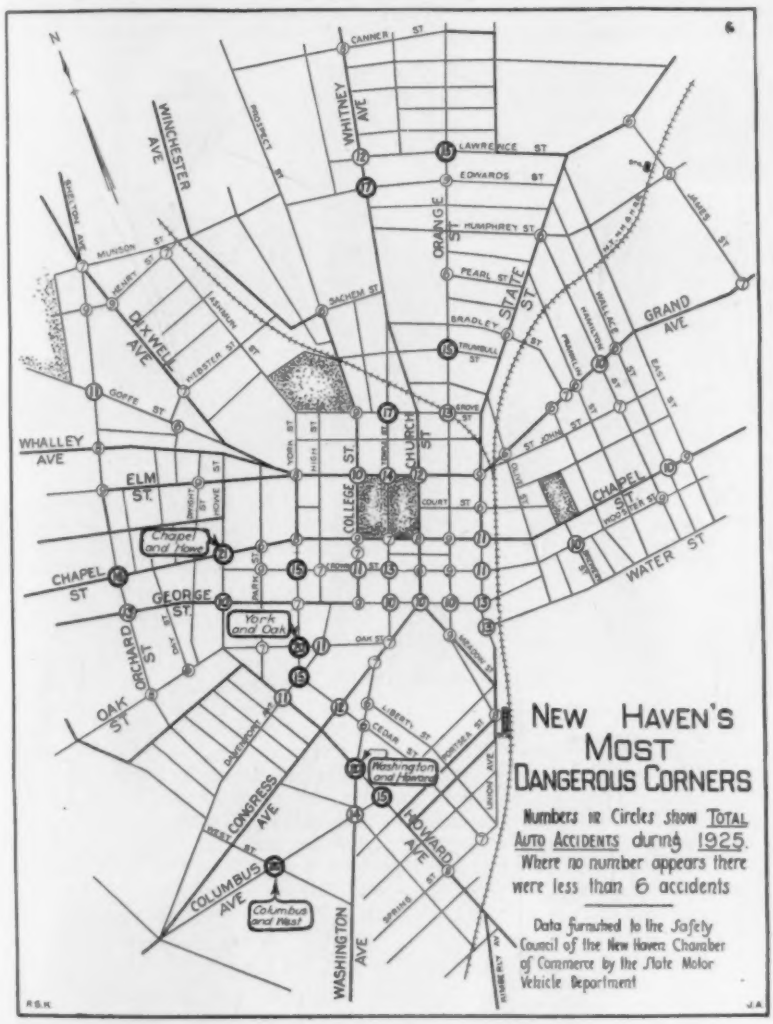
Mapping Dangerous Street Intersections

NEW HAVEN, CONN.—Under the direction of Professor R. S. Kirby of Yale University, and with the cooperation of the Connecticut State Motor Vehicle Department, the Statistical Committee of the Safety Council of the New Haven Chamber of Commerce made an exhaustive study of highway accidents in this city during 1925.

From the data secured through this survey, the Committee has developed the map reproduced herewith, which shows at a glance the most dangerous street intersections in this city from the standpoint of traffic accidents. In this analysis, all accidents in which property damage amounted to $10 or more, or from which any personal injury resulted, have been included. In addition to this map, the Committee is keeping a spot map showing the location of serious highway accidents and child accidents. A comparison of these two maps affords a very fair perception of the traffic accident situation in the city.

The primary purpose of this detailed study is to give the Safety Council something definite on which to base its accident prevention work. When the number of accidents at any intersection in the city reaches beyond the average, the Council proceeds to investigate the reasons therefor, and, wherever possible, to propose methods of eliminating the difficulties.

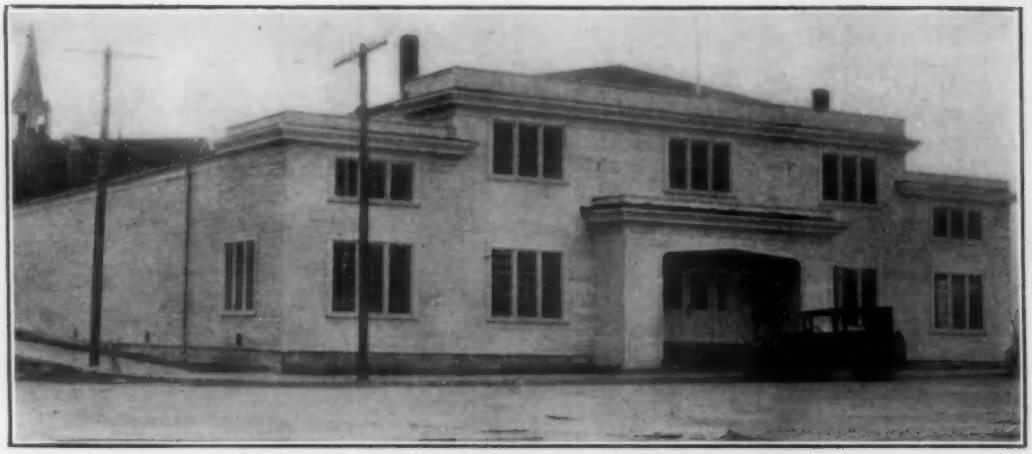
N. N. MARSHMAN,
Assistant Secretary, New Haven Chamber of Commerce.



A Little City's New Community Building

NORTH BEND, ORE.—For some years the little city of North Bend has felt the need of some sort of community building which could be used as an auditorium for Chautauquas, concerts, lectures, etc., as well as a gymnasium and a basketball court for the use of our young folks.

Two years ago the community voted $30,000 in bonds for the purpose of erecting such a building, but the City Council did not approve of the plan and refused to erect the building. Later the American Legion decided that they would promote a building, but they became discouraged and gave it up. About the middle of December, 1925, the Chamber of Commerce took the matter up and appointed a com-



THE COMMUNITY BUILDING AT NORTH BEND, ORE.

mittee to devise ways and means by which the wishes of the people could be carried out. In less than ten days the foundation was being laid for one of the most commodious community buildings in southwestern Oregon. The City Council gave the Chamber half a block in the heart of the city, a site 200 x 210 feet in size. Subscriptions were solicited with generous response, the pledges ranging from $5 to $300. In less than two months the building was ready for dedication, and it has since been used practically every day and night.

The structure measures 100 x 110 feet, with a floor space 60 x 90 feet for basketball and dancing. The building has a gallery and a well-equipped stage. It has a hardwood maple floor. There are showers, baths, locker-rooms, and other conveniences. In the front of the building there are four commodious rooms to be used by ladies' clubs and other organizations.

The total cost of the building is approximately $12,000. While it is built of frame, it is of very substantial construction, and the committee in charge intends to have it stuccoed. The total seating capacity is 1,200.

It is the purpose a little later to erect a natatorium on the vacant part of the lot adjoining the building.

The Chamber of Commerce looks upon this enterprise as one of its outstanding achievements.

J. E. SNYDER,
Secretary-Manager, North Bend Chamber of Commerce.

THE FLAG PRIZE, FORT WAYNE

Yard Beautification Campaign Has Many Benefits

FORT WAYNE, IND.—Arousing a city to the realization of its need for beautiful yards; transforming that city in five years from an ordinary expanse of carelessly kept yards, whose plainness was only emphasized by occasional beauty-spots, into a place renowned for its attractive premises, interesting the visitor and the inhabitant alike; adding more than a million dollars to the real estate valuation of the community—these are a few of the striking results achieved through an organized effort for yard beautification carried on in Fort Wayne.

Functioning through a "Better Yards Committee" of the Chamber of Commerce, a number of interested citizens have during that time built a complete organization which has achieved these results.

Nearly 15,000 yards, more than half the total number in the city, were investigated by workers during the 1925 campaign. Over 300 voluntary workers, in addition to the executive committee of 15, were required to complete the task.

Annual contests are held in order to stimulate interest in yard beautification. The city is divided into sixteen large districts, which are in turn subdivided into fifty-four smaller divisions. First, second, and third prizes in the form of bulbs or plants are awarded to the best yards in each of the smaller divisions. Thousands of bulbs and plants have been awarded in this manner by the committee. A standard score card, listing the characteristics of a correctly designed and well-cared-for yard, and giving percentages to the contributing factors, are used in grading the yards.

Climaxing each year's work, an annual fall flower

See Section 7 (pages 117-123) of the 1926 Municipal Index for an important list of local civic-commercial organizations of their secretaries.

festival is staged. Hundreds of amateur and professional growers exhibit at the show, and thousands of visitors view the displays of fall flowers, ferns, cut flowers, and potted plants of every description. Cups, plants, and ribbons are awarded as prizes for the best exhibits. A spring iris and peony show is also held each year, marking the official opening of the "Better Yards" work. Numerous exhibits of these flowers, many of them entered by nationally prominent iris and peony growers, are displayed at the spring show.

A considerable amount of educational work is carried on by the committee. Several large public meetings are held during the year at which some recognized authority on yard beautification, flower culture, or landscaping makes an instructive address, usually illustrated with slides. The evening programs at the fall flower show also include addresses of this nature. The attentive crowds at these meetings attest the general interest and desire for practical information on the part of citizens.

In the school children's flower show, held in conjunction with the fall festival, the educational feature is paramount. During the spring several thousand plants are distributed to the public and parochial schools by the Park Board. Instructions for their care are issued by the "Better Yards" committee, and the plants are cultivated during the summer by the pupils.

At the fall show these plants are exhibited and prizes awarded to individuals and schools. The grand prize is a large silk flag, bearing the city emblem—three white stripes converging upon a background of blue, signifying the city's three rivers, and two stars, signifying its position as the second city of the state. Superimposed upon this device is an iris, the official emblem of the "Better Yards" movement.

Through its work with school children, the committee seeks to inculcate an appreciation of, and a desire for, beautiful surroundings, which it believes will result in great future benefits to the city.

CARL W. ROTHERT,
Secretary, Better Yards Committee, Fort Wayne Chamber of Commerce.

Need for Planning in Outlying Business Centers of Municipalities

RAPIDLY growing shopping districts in outlying sections of a city can make or break property values as they are carefully planned and controlled or allowed to grow helter-skelter, according to J. C. Nichols of Kansas City, Mo., director of the National Association of Real Estate Boards and a member of the Association's committee on planning metropolitan areas, in an article printed in the current issue of *The Journal of Land and Public Utility Economics*. This planning committee is cooperating with the American City Planning Institute in studying methods of control for regions just outside a city's corporate limits.

Automobile congestion in down-town streets, the piling up of population into the air in outlying large apartment house centers, and the creating of night life in the outlying suburban centers through motion-picture theaters and other amusement places, are, Mr. Nichols points out, bringing about a large development of suburban shopping-centers, the control of which is vital in preserving the beauty and in serving the best interests of the city in the future.

In American cities of any considerable size our new outlying business centers frequently are becoming the ugliest, most unsightly and disorderly spots of the entire city," Mr. Nichols says. "New traffic throats of congestion are being created that will sooner or later call for the expenditure of gigantic sums of public funds to relieve. Buildings of every color, size, shape, and design are being huddled together. A mixture of glaring billboards, unsightly rubbish dumps, hideous rears, unkempt alleys, dirty loading docks, unrelated, uncongenial mixtures of shops of every type and use, shacks and shanties mixed with good buildings, great masses of unpainted common brick walls reared beside the little shop building that is of good design, are bringing about disorder and unattractiveness that threaten to mar the beauty of the residential regions of American cities."

In the development of shopping centers Mr. Nichols recommends that no streets should be laid out less than 100 feet in width. The paving width should be at least 60 feet, and preferably as great as 72 feet, in order to give diagonal parking for automobiles, thereby increasing two and one-half times the parking area on the streets. The provision of loading- and unloading-courts in the interior of business center blocks is desirable in order to relieve the front streets of all delivery trucks. Alleys should be wide enough to allow three lines of truck traffic for blocks that are not of sufficient size to allow these interior courts.

"These new shopping centers should be built horizontally and not vertically," the article warns, in advocating control of building heights. "It is difficult to make outlying stores pay a rental above the second story. Moreover, every additional story in a shopping center increases the amount of traffic in front of the building."

Massing of the shops into contiguous blocks radiating from one center, as opposed to the string-street development where continuous shops are built on each side of a street one or two miles in length, is advised to overcome the traffic difficulties that result from the increased flow of travel that the string business street invites. Grouping of related shops with attention to variety of building fronts to give interest to the street will add to the attractiveness of the district.

"America has an opportunity in this new era of building outlying shopping centers. It is possible to make these shopping centers distinctive and appealing in appearance, individualistic and attractive in design and layout, affording character and color to the general appearance of the city. Cleanliness and good order, a reasonable uniformity and harmony of design, height, and elevation, will go far to make our American cities more attractive, more appealing, and of unquestioned value to the people who live in these cities. Out of this order and cleanliness will come a practical beauty of great intangible value to the spirit, patriotism, and well-being of any community."

Chamber of Commerce Urges Use of Public Garages and Open Parking Spaces

IN a recent issue of *Greater St. Louis*, a strong appeal to auto drivers to help relieve the congestion on the down-town streets of St. Louis is made by Paul V. Bunn, General Secretary of the St. Louis Chamber of Commerce. The article presents a list of down-turn public garages and down-town public parking spaces, with a list of the car capacity and rates charged by each. Says Mr. Bunn, in commenting on this survey:

"There are several views to this parking matter. The retail storekeeper wants his customers to be able to get freely to his entrance; but, without some regulation, his street becomes clogged up. and then no one can get anywhere.

"The question is, how to draw a proper line between the two extremes and decide what are the fairest regulations that can be made.

"Broadly speaking, the 'down-town' district is bounded by the river, Eighteenth, Spruce and Wash Streets. In this district there are 275 blocks.

"Deducting for fire-plugs, alleys, safety zones, etc., an average of only 40 cars could be parked all around one block, even if there were no restrictions at all. That's a total of 11,000 cars, which would fill up every one of these 275 blocks —and then nothing could move.

"Recently a number of public garages have been built in this section. The 24 garages can accommodate 7,022 cars, while the 22 open parking spaces will take care of about 1,780 more; and no doubt several others will be built soon. That's a grand total of 8,802 cars that can be handled at one time, or four-fifths as many as would clog up the entire 275 blocks. So, if regulations seem drastic, at least it is evident that you *can* put your car somewhere.

"My appeal is that all these spaces be patronized. If you must bring your car down-town, put it where it will not clog traffic, and where its protection against damage will be worth all the yearly parking fees.

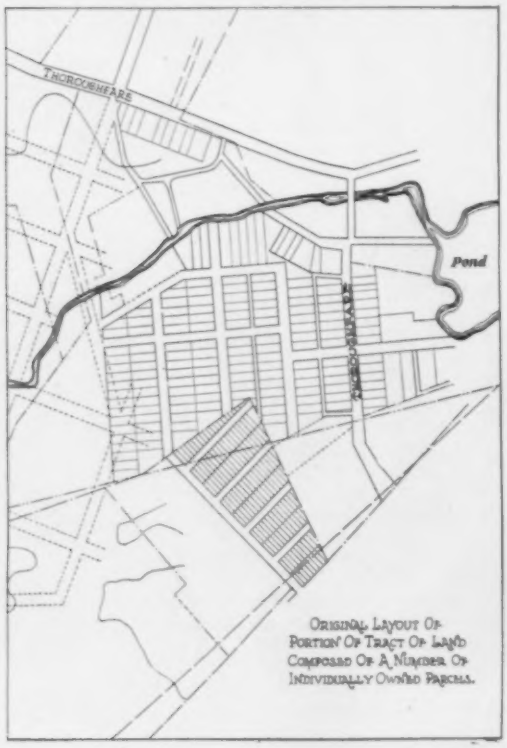
"But no man could successfully hold that he has any right to leave a dead car against the curb all day, blocking the arteries of business, either to save a few dollars a month, or to save walking a few blocks daily before taking his ride."

EDITORIAL NOTE.—St. Louis has recently opened a magnificent new Union Market and Garage Building, with storage capacity of about 600 cars. (See page 414 of this issue.)

Real Estate Subdivisions and City Planning

To the Editor of THE AMERICAN CITY:

We believe the idea of Messrs. Swan and Tuttle, in "Land Subdivisions and the City Plan," that all subdivisions in a city should comply with the major thoroughfare plan, should be carried further. It is necessary to plan so that subdividers shall take into account the future development of the adjacent territory. The usual difficulty is not so much one of access to the property over the main thoroughfares, but the impracticability of



ORIGINAL LAYOUT OF PORTION OF TRACT OF LAND COMPOSED OF A NUMBER OF INDIVIDUALLY OWNED PARCELS.

REVISED LAYOUT OF PORTION OF TRACT OF LAND COMPOSED OF A NUMBER OF INDIVIDUALLY OWNED PARCELS.

intelligently laying out any individual tract of irregular shape, unless it be done with a consideration of how the surrounding territory also can be developed most beneficially.

The plan, "Original Layout," on page 436, illustrates the altogether too common but impracticable method of laying out individual tracts of land of irregular shape and under separate ownership, without taking into account the surrounding territory. The other plan, "Revised Layout," is a portion of the layout of a 400-acre tract, including the small tracts in the original layout made to fit not only the topographical conditions, but also the adjacent tracts of land. This revised layout disregards the property lines where they are not such as to make a practical development possible.

Here at Pittsburgh the Department of City Planning has under way a triangulation and topographical survey of the city and environs. The survey is being carried on with much accuracy. When completed it will be of almost inestimable value to engineers in developing public works and city planning programs and to realtors in their promotion and layout of subdivisions. It is intended with this map to plot and file, as a basis for individual developments, suitable block and lot arrangements, so that owners will know what is believed to be a rational subdivision of property with a consideration of the surrounding territory. This promises to be an important contribution to the ultimate betterment of Pittsburgh.

MORRIS KNOWLES,
Chairman, City Planning Commission, Pittsburgh, Pa.

* "Land Subdivisions and the City Plan" is a supplement to the *National Municipal Review* for July, 1925.

Permanent Decorations for a Little City

EARLY in February the members of the Horticultural and Floral Society of Redlands, Calif., begin to list the trees, shrubs, bulbs, and packets of flower seed they can supply for their annual "Planting Day." This is not merely an exchange among themselves of these things, but a calling together of all the school children for a pretty outdoor pageant, following which each child is given some carefully labeled material after he or she has solemnly pledged to plant it properly and care for it continuously according to typewritten directions.

As Redlands is ambitious to be known as a "City of Roses," most of the gifts are rose-bushes. The planting which follows immediately is almost as interesting, the children naturally enlisting their parents in the actual work and making it a gala occasion in every neighborhood. A splendid community spirit is aroused, as well as personal pride in home surroundings, and although the plan has been in effect for only a few years, great results are apparent.

DISTRIBUTING ROSES AND ORANGES TO TRANSCONTINENTAL TOURISTS

THE MUNICIPAL OUTDOOR THEATER AT REDLANDS SEATS 2,500 PEOPLE

But the town is determined to be patriotic as well as beautiful. Practically all buildings in the business section are already equipped with flagpoles on the top, and now, through the Chamber of Commerce, a uniform decoration of the sidewalks is being put in, amid genuine enthusiasm. Holders are being installed in the concrete along the curb at regular intervals, each standard to be 12 feet in height, and one, at least, before every store entrance. These will provide a striking decoration, as flags of a certain size will be used and ropes will be arranged to run them at half-mast when proper. Two hundred flags have been sold for the purpose.

Henceforth, holidays will be unusually impressive here, and all the year the home lawns will be attractive and increasingly lovely with their well-cared-for growth.

Governor Urges Reorganization of County, Town, and Village Governments

IN a special message to the New York State Legislature, on March 15, Governor Alfred E. Smith urged attention to the problems of county, town, and village government, to "rebuild and modernize a machine which is over 200 years old."

The Governor called attention to the fact that a report submitted in 1923 at a special meeting of the Legislature by a Joint Committee on Taxation and Retrenchment, under the chairmanship of Senator Davenport, after a thorough study of county, town, and village governments, had pointed out that most of the aspects of these local governments had not been altered since the Provincial Government of New York was established after the Dutch were driven out in 1664.

"In other words," wrote the Governor, "we are living to-day, as far as county and town government are concerned, under the laws promulgated by the Duke of York in 1676. Town officers elected to-day are almost without exception the same town officers who were elected before 1700. The only change made since then in town government has been the authorization to create special districts for special purposes, such as sewers, fires, sidewalks, etc., and even these districts were created without any understanding of the results which would follow, because they overlap one on the other and set up within one township all sorts of overlapping special governments and special tax districts."

Many examples were cited by the Governor of the way in which counties are falling down on almost every function of government, including health administration, the charity and poor law system, highway building and maintenance, the administration of justice, methods of assessment and taxation, etc. The absence of anything like adequate county planning throughout the state was especially emphasized, there being at the present time not a single county planning and zoning board in New York and only the beginning of a town planning system. Neglected opportunities for cooperation among local authorities on such matters as water-supply, sewers, and garbage disposal were also emphasized.

A method of government for counties analagous to either the commission manager or the "strong mayor" form of municipal government was urged by the Governor. On this subject the message said:

"Every student who has ever given this problem any consideration at all agrees that there must be some kind of a proper county executive whether it be an elected county president or a county manager serving under a small county board. The county Boards of Supervisors in this state in most cases have entirely too many members. Some of them have over fifty. How can a Board of Supervisors of sixty or fifty or even thirty members carry on the executive work of a county? The county supervisors are elected from towns and wards, and none of them represents the county as a whole.

"This mixing up of legislative and executive functions has never been successful anywhere. It is agreed that many town functions must be transferred to the county and that a reasonably long term for the executive should be established. It is also agreed that the same changes which are now being made in the state government looking to the consolidation of departments, appointment of department heads by the county executive, reduction in the number of elective offices, and a real county budget system are essential in all of the large and growing counties of the state."

Fire Chief Urges Greater Precautions Against Chimney Fires

THE increased use of soft coal for residence heating last winter, necessitated by the recently ended coal strike, makes precautions against chimney fires more than ordinarily important. In this connection the *Newark Evening News* quotes a timely warning by Fire Chief Koeber, of Bloomfield, N. J., to the local householders:

"It's bad enough now, but later on, say about next fall when the soft coal soot has had a chance to dry out and the first furnace fires begin to get warm, that's when my men are going to be continually on the run.

"Most of the fires we've had because of chimneys have shown me just how most of the chimneys in the town are. There's soot more than an inch deep hidden in corners and hanging from the bricks. That soot is sort of oily and wet now, but after this summer it's going to be worse than tinder."

A similar warning by fire chiefs generally might help to convince many a householder that it would be unsafe to wait until next winter in the hope that Santa Claus would do the chimney cleaning job.

City Departments Help Flower Market

An Annual Event in Baltimore Which Stimulates Interest in a More Beautiful City and Helps to Finance the Women's Civic League

By Mrs. Alison H. Shaw

Executive Secretary, Women's Civic League, Baltimore, Md.

SPRING in Baltimore brings not only blue skies and green trees, not only warm days and sunshine, it brings the annual Flower Market which the Women's Civic League holds each year around the Washington Monument in historic Mt. Vernon Place. While the League is still busy with winter work will come whispers of new ideas being held in reserve for the Flower Market, and we realize that it is time to appoint the chairman. The Flower Market Committee is a permanent one, the Chairman being appointed each year and holding office until her successor is appointed. She in turn forms her own Executive Committee, in recent years having a representative from each standing committee of the Civic League. This Executive Committee decides the date of the Flower Market, appoints new booth chairmen where needed, makes the general plan, and does the construction. The booth chairman secures her own helpers, collects her own stock and finds her booth constructed and ready for decoration at two o'clock the afternoon before the Market. Each committee of the League is responsible for a booth; the Garden Clubs in Baltimore and the surrounding counties, most of them members of the Garden Club of America, each have a booth; and in addition we have a number of special features, such as toys for the children, a basket booth, a grab bag in the form of an old colored mammy, a mammoth lemon pierced with a peppermint stick five feet long, a gypsy tent where one's fortune can be told, a picture gallery where silhouettes are cut, and a lovely booth of wild flowers brought in by the children of the school gardens.

The Flower Market is held around the base of the Washington Monument, which tops Mt. Vernon Place and can be seen from all directions. Three stalls are placed at each side

FLOWER MARKET AROUND THE WASHINGTON MONUMENT, BALTIMORE

of the square, one large or two small ones at each corner; several are placed around the railings of the Monument; and an especially made round table stands at each corner also, but in the street.

One thing must be kept in mind and stressed on many occasions—it is that this is a market for flowers and that, with the exception of food and entertainment, only flowers and articles pertaining in some way to the garden are to be sold. This does not draw as fine a line as one would think, for shrubs, seedlings, ferns, cut flowers, window-boxes, both full and ready to be filled with seedlings bought on the spot, flower vases, fresh vegetables (asparagus cut that morning is the most popular seller one can find), strawberries, fresh eggs, garden aprons, picking baskets, garden hats, garden furniture, seeds, markers, garden magazines, all come in this category. Indeed, there is no end to the things one can find that are both salable and beautiful.

One of the most attractive booths is that of the school gardens. Baltimore has an excellent school garden system, and the children love to bring a donation, whether it be a few pansies they have grown in their own gardens or a bunch of daisies or buttercups picked in some far-off field.

Through the courtesy of the Mayor we are given the greatest amount of cooperation by the city departments. The Park Board allows the use of the Washington Monument and the surrounding squares and in addition decorates the steps of the Monument on each of the four sides with masses of ferns, palms, and blooming plants. They also send park benches to scatter about for the comfort of the people.

The Highways Engineer's Department is an invaluable assistant. The men from this department bring all the equipment from the basement of the Peabody Institute, where it is stored, to the Monument, set up the stalls which do not need the services of a carpenter, rope off the lunchroom and help decorate the Market. They attend to the odds and ends that crop up during the day, and when the Market is over tear down the construction and again store things away.

The Police Department gives a watchman for the equipment the night before the Flower Market, protection all day with a special detail to accompany the treasurer from the Monument to the bank when she makes her collections, one at two o'clock, and a second about seven o'clock, and another watchman that night.

The Street Cleaning Department also comes to our aid with freshly painted trash-cans and twelve white wings who spend the day keeping the squares clean. The following day extra men and trucks are sent to help clear away.

Even the state departments are interested. The State Roads Commission cuts and hauls evergreens for decorating, if a development can be found where the trees are being cleared out. There is another department always willing to help and whose offer we hold in reserve, hoping we shall never be obliged to avail ourselves of it. This is the State Militia, which is asked to reserve the Fifth Regiment Armory for the day following the one chosen for our fête. This is to be used only in case of rain two days in succession. An outdoor affair can be postponed one day, but two days would be fatal.

A complete list of those who contribute to the beauty and success of the Baltimore Flower Market would read like a city directory. Every one is interested, every one helps. The merchants, both wholesale and retail, give most liberally, one even sending a truck and driver for the afternoon to aid with the delivery. Two bands, the Newsboys and the Poly School bands, help liven things up.

Pubicity is one of the main necessities of a successful fête. Baltimoreans have grown used to our dainty lady watering her flowers under a tree, so it is used on the regular posters, on small stickers for the backs of envelopes, on larger stickers for the windshields of autos, and on post-cards giving the day and place of the Flower Market and what will be sold. The newspapers are more than kind in giving space, and the publicity chairman uses as many parts of the paper as possible. The radio, used for the last two years, gives a notice on a different page of the paper, as well as the actual broadcasting.

The proceeds from the Flower Market are a big factor in the finances of the Civic League, which has a one-dollar general membership, although many public-spirited women give much more each year.

Every one loves flowers and there is a fascination about growing them once the interest is aroused. The extent to which the Women's Civic League has been successful, through the Flower Market and the Home Garden Committee, in arousing this interest and making Baltimore a garden city can best be shown by the rows and rows of back-yard gardens divided only by a vine-covered wire fence and giving the effect of one garden along the entire length of the square. These gardens can be found in any part of the city and are

one way in which the Women's Civic League aids "in promoting the safety, health and welfare of the people of the city of Baltimore."

EDITORIAL NOTE.—The foregoing article comprises parts of a paper presented at the recent annual convention of the National Association of Civic Secretaries. Mrs. Shaw will be glad to send to any organization desirous of starting a similar flower market, additional details as to methods of organization, luncheon arrangements, etc.

Have Municipal Salaries Kept Pace with the Increased Cost of Living in Recent Years?

IN connection with the publication in THE AMERICAN CITY for March, 1926, of a list of salaries of councilmen, mayors, city clerks, and city engineers of the 248 cities of over 30,000 population, compiled from the latest Census Bureau report, a request was made for information regarding higher salaries which may have gone into effect for any of the positions listed since the date of this report (1923).

Up to the time of sending the present issue to press, such increases which have been brought to our attention are:

	Salary Reported in 1923	Present Salary (1926)
MAYORS		
Birmingham, Ala.	$6,000	$8,000
Boston, Mass.	10,000	20,000
Macon, Ga.	3,000	5,000
Poughkeepsie, N. Y.	1,000	2,000
Schenectady, N. Y.	6,000	6,500
COMMISSIONERS		
Birmingham, Ala.	$4,500	$7,000
Washington, D. C.	5,000	7,500
CITY ENGINEERS		
Charleston, W. Va.	$3,400	$3,700
Easton, Pa.	2,500	3,500
Flint, Mich.	7,000	7,800
Green Bay, Wis.	3,000	3,200
Lawrence, Mass.	2,900	3,156
Medford, Mass.	2,750	3,000
Milwaukee, Wis.	5,000	6,500*
Newark, N. J.	6,000	15,000
New Britain, Conn.	3,500	4,800
Quincy, Mass.	2,750	3,000
Topeka, Kans.	2,800	3,000
CITY CLERKS		
Allentown, Pa.	$2,000	$2,400
Amsterdam, N. Y.	2,000	2,200
Cambridge, Mass.	3,800	4,000
Charleston, S. C.	2,700	2,820
Easton, Pa.	2,000	2,400
East Orange, N. J.	3,200	4,500
Flint, Mich.	3,600	4,000
Grand Rapids, Mich.	3,000	3,900
Green Bay, Wis.	2,300	2,400
Hazleton, Pa.	1,680	1,920
Joliet, Ill.	2,400	2,700
Lancaster, Pa.	1,440	3,000
Lansing, Mich.	2,400	3,000
Milwaukee, Wis.	3,600	4,200
Newark, N. J.	7,000	8,000
New Bedford, Mass.	3,800	4,200
New Britain, Conn.	3,000	3,300
Newburgh, N. Y.	2,500	2,750
Niagara Falls, N. Y.	3,300	4,200
Pensacola, Fla.	2,500	3,000
Peoria, Ill.	2,600	3,000
Reading, Pa.	2,400	2,820
Rochester, N. Y.	3,300	3,600
Syracuse, N. Y.	3,200	6,000
Utica, N. Y.	3,600	4,000
Williamsport, Pa.	1,440	2,300 plus fees

* The City Engineer in Milwaukee is subordinate to the Commissioner of Public Works, who is now receiving a salary of $8,000.

In the February 9 issue of *Public Service*, Dr. William H. Allen, Director of the National Institute for Public Service, quotes the United States Labor Bureau statistics as showing that 100 and 173.5 cents to-day are needed to buy what 58 and 100 cents bought in 1913. In urging consideration of these figures in connection with teachers' salaries, Dr. Allen says:

"Teachers' salaries buy 42 per cent less, dollar for dollar, than they did in 1913. Taxpayers and school boards should be helped to remember that fact whenever they are told of teachers' salaries.

"A lowered standard of living is the lot of every person, who wasn't miserly in 1913, whose pay today is not 173.5 per cent what it was in 1913.

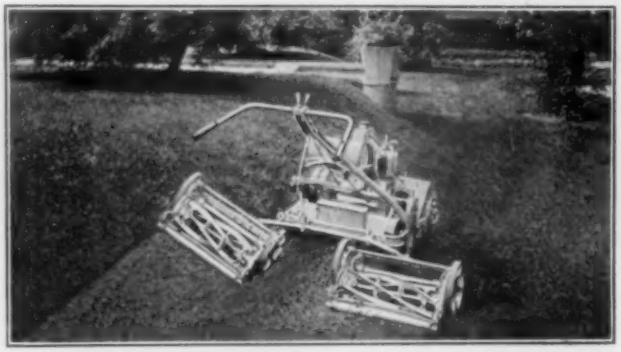
"To see if one's own standard of living has risen or fallen, multiply the 1913 salary by 1.735 or divide today's salary by 1.735 and line this up back to back, with the 1926 salary. The difference is one's gain or loss in purchasable standard of living, including power to save.

$1,200 in 1913 equals $2,082 in 1926.
$1,200 in 1926 equals $692 in 1913.
$2,000 in 1913 equals $3,470 in 1926.
$2,000 in 1926 equals $1,160 in 1913.
$6,000 in 1913 equals $10,410 in 1926.
$6,000 in 1926 equals $3,480 in 1913."

THE AMERICAN CITY will welcome any information which readers may furnish regarding other recent increases in salaries of city officials and employees.

THE REAL CURE FOR A GREAT EVIL

The great evil of modern civilization is congestion. The only real cure for congestion is decentralization; all others are mere palliatives, which ultimately increase the evil instead of lessening it. To successful decentralization regional planning is essential. In no other way can the trend away from the city be encouraged and guided into safe paths. Everywhere these truths are being recognized; earnest consideration is being given to the subject, and legislation with that object in view is beginning to appear.—From "Progress of City Planning Law During 1925," by Frank B. Williams, in The Municipal Index for 1926.



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Zoning Notes

Prepared by Frank B. Williams

Author of "The Law of City Planning and Zoning"

From data collected by the Zoning Committee of New York (233 Broadway)

Mr. Williams may be addressed in care of THE AMERICAN CITY, 443 Fourth Avenue, New York

Recent Zoning Ordinances

ST. AUGUSTINE, FLA.—Ordinance, November 23, 1925.

DES MOINES, IOWA.—Ordinance, January 22, 1926.

SPRINGFIELD, MASS.—Amendment of Ordinance, 1926.

GREENSBORO, N. C.—Ordinance, February 23, 1926.

BETHLEHEM, PA.—Ordinance, March, 1926.

Recent Zoning Decisions

ARKANSAS.—*City of Little Rock v. Pfeifer, Supreme Court,* 277 S. W. Rep. 883. Pursuant to statute (Act No. 6, 3rd Extra Session, 1924) authorizing cities of the first class to establish zones for building purposes, the city passed an ordinance providing that business and industrial structures shall not be erected in "what is commonly known as the residence district" of the city "outside the fire limits" without a permit, and in case of protest, the matter shall be referred to the City Council, which, after hearing, shall grant or refuse the permit as it may deem best.

The statute provides that in case of abuse of discretion by the Council, in granting the permit, the adjacent property owners may appeal to the Chancery Court.

Appellees were the owners of a vacant lot in that part of the city known as Pulaski Heights. They were granted a permit, which was revoked by the Council in the interest of adjacent property owners, before any work had been done on the building but after the contract for its construction had been let and considerable expense made. This action is for an injunction to prevent the city authorities from interfering with the construction of the building; which was granted.

In *Herring v. Stannus, (Ark.),* 275 S. W. Rep. 321, this ordinance was sustained in so far as the regulation of gasoline stations was concerned. The Court concludes now that the decision in that case necessarily upholds the validity of the statute and ordinance as to the structures mentioned therein.

Neither the statute nor the ordinance contains any provisions for a remedy for a property owner when a permit is refused. *Held,* that a remedy must exist, and that the present remedy is proper in such cases.

The Court finds that the locality was business in character, and the action of the Council in refusing the permit arbitrary and an abuse of discretion.

LOUISIANA.—*State ex rel. Giangrosso v. City of New Orleans, Supreme Court,* 106 So. Rep. 540. A municipal zoning ordinance enacted pursuant to Act No. 27 of 1918, and operating alike on all persons similarly situated, is not arbitrary, nor does it impair the obligation of contracts, or deny due process or equal protection of the law, contrary to the Constitution of Louisiana or that of the United States, but is a valid exercise of the police power. *State ex rel. Civello v. City of New Orleans,* 154 La., 271, followed.

NEW JERSEY.—The rulings of the courts continue to be adverse to zoning: *Franklin Realty and Mortgage Co.* v. *South Orange,* 4 N. J. Adv. Rep. 109, *Rudensky* v. *Board of Adjustment of Montclair,* 4 N. J. Adv. Rep. 103, *State ex rel. Berry* v. *Garner,* 4 N. J. Adv. Rep. 89, *State ex rel. Edden* v. *Garner,* 4 N. J. Adv. Rep. 90, *State ex rel. Ross* v. *Dowling,* 4 N. J. Adv. Rep. 112, following the "Nutley Case" (Ignaciunas v. Risley, 125 Atl. Rep. 121), *The State, Lutz and Clayton* v. *Kaltenbach,* 4 N. J. Adv. Rep. 341, and *Warner* v. *Board of Adjustment of Newark,* 4 N. J. Adv. Rep. 344, following *Krumgold and Sons, Inc.,* v. *Jersey City,* 3 N. J. Adv. Rep. 1546, and *Vatter* v. *Kultenbach,* 131 Ark. Rep. 900, following *Lutz* v. *Kultenbach,* in Court of Errors and Appeals, which follows the Krumgold case.

NEW YORK.—*Village of North Pelham* v. *Ohliger, Supreme Court, Appellate Division,* reported in *New York Law Journal* for February 13, 1926, p. 1948. A "finding of fact that the plaintiff village herein permitted the construction and erection of the said garage without protest by its officers until the 24th day of November, 1924, is not supported by the evidence. . . But even if the finding were supported by proof, it would not justify a conclusion that plaintiff is chargeable with laches or is estopped from proceeding against defendants. Defendants knew the building operation was in violation of law. The alleged failure of the village authorities to enforce the law cannot be visited upon the village."

NEW YORK.—*People ex rel. Sabbaese* v. *Walsh.* A view of the premises, with the consent of the attorneys for the parties, sustains the claim of the relator that "there are practical difficulties and unnecessary hardships in the way of carrying out the strict letter of the provisions of the resolution," which resolution denies to the relator the right to build a garage upon his premises. At the hearing before the Board of Appeals the decision of the Superintendent of Buildings denying the relator's application herein was sustained, although three of the five members of the Board voted to grant such application, an affirmative vote of four being necessary for a variance. An examination of the record of the hearing had before the Board of Appeals discloses that at least one of the members of the Board, whose vote was cast against a variance and thereby sufficed to cause a denial of the application, proceeded upon an entirely irrelevant and illegal theory in that the matter of consents of adjoining property owners, which are material under Section 7-g, but not under Section 21 (of the New York City zoning resolution), clearly played an important if not a dominant part in his determination.

The decision, therefore, having been arrived at illegally, is properly reviewable here upon the merits (see *People ex rel. Karmensohn Holding Corporation* v. *Walsh,* 120 Misc. 467; *People ex rel. Parry* v. *Walsh,* 121 Misc. 631). From the

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character of the neighborhood, it is evident that the action of the Board of Appeals was clearly an arbitrary exercise of discretion under the circumstances. The writ of certiorari is therefore sustained, the decision of the Board of Appeals reversed and set aside, the variance of the building zone resolution granted and a permit directed to issue.

NEW YORK.—*People ex rel. Stevens* v. *Clark, et al., Board of Appeals of City of White Plains (Supreme Court)*, 213 N. Y. Suppl. 350. Unquestionably, the zoning ordinance of the city is valid. Under it an apartment house may be built upon the lot in question, but the height, the percentage of the area of the lot, and the number of families per acre, in the district in which the lot is situated, are subject to certain limitations. The building inspector's refusal of a permit for an apartment house exceeding these limitations was proper, as the Board of Appeals was without authority to reverse it, in the absence of practical difficulties or hardships.

Recent Zoning Literature

The Department of Commerce at Washington, D. C., under date of February 15, 1926, has classified and listed the cities, villages, and towns of the United States which have adopted zoning ordinances, according to their population. The lists will be most valuable to the students of zoning in this country.

The latest number of the *Journal of Land and Public Utility Economics* contains an article by J. C. Nichols of Kansas City, the well known real estate developer, on "The Planning and Control of Outlying Shopping Centers."*

The *Cornell Law Quarterly* for February, 1926, prints a long and carefully written article entitled "Zoning Legislation," by Newman F. Baker, Special Assistant Corporation Counsel of the city of Chicago, and Graduate Fellow of the University of Chicago Law School. The article is fully annotated. The reader will recall a reference, in a former number of this magazine, to Mr. Baker's article on the "Constitutionality of Zoning Laws" in the *Cornell Law Quarterly* for November, 1925.

The latest information with relation to zoning and planning in Canada will be found in the *Journal* of the Town Planning Institute of Canada, published in Ottawa, for February, 1926. In it is given the British Columbia Town Planning Act, passed December 18, 1925, and a review of the act by A. G. Smith, containing the zoning law, as well as the Ottawa Zoning By-Law, and an article on zoning by Noulan Cauchon, President of the Town Planning Institute of Canada.

The March number of this magazine contained an address by Bertram H. Saunders, Chairman of the North Jersey Transit Commission, delivered at the annual meeting of the New Jersey State League of Municipalities, entitled "Zoning: What Can Be Done for It Where the Courts Are Unfavorable?" This is a pressing question in New Jersey, and the author's experience in that state enables him to speak with authority. Reprints are available.

* Quoted in part on page 435 of this issue.

The City's Legal Rights and Duties

Conducted by A. L. H. Street, Attorney at Law

The Renting of Space in City Hall Upheld

It was proper for city authorities to lease space in the city hall for private business purposes not interfering with the administration of municipal affairs, the building being larger than was required for municipal purposes, held the Texas Court of Civil Appeals in the case of City of Mission vs. Richards, 274 Southwestern Reporter, 269.

Inviolability of Park Property

A city has no right to grant a railway right of way through property conveyed to the city under a dedication for park purposes, held the Washington Supreme Court in the case of State vs. Superior Court, 238 Pacific Reporter, 985. The Court said, in passing:

"The Legislature may confer on a municipality power to devote property it holds in a trust capacity for a particular use to uses in addition to and inconsistent with the use for which it acquired it. But the authorities are equally uniform that the power must be specially conferred, either by express grant or by necessary implication arising from an express grant, and is not conferred by a general grant empowering the municipality to acquire, hold, and dispose of property."

Referring to statutes authorizing Washington towns to acquire, etc., property, the Court adds:

"But these provisions . . . in our opinion relate to property which the city acquires for its ordinary municipal purposes, property the title to which it holds in fee, and over which it may exercise the rights belonging to and following ownership in fee, and do not relate to property which it acquires in trust for a specifically designated use and purpose, and over which it has only the powers of a trustee."

City Held Not Liable for Failure to Enforce State Law

That a city licensed a hotel not equipped with fire-escapes as required by a statute of the state, did not make the city a party to the creation of a nuisance in such sense as to make it liable with the hotel proprietor for deaths of occupants of the building, attributable to absence of fire-escapes. In reaching this conclusion in the case of Bilderback vs. City of Klamath Falls, 6 Federal Reporter, 2d Series, 642, the United States District Court for the district of Oregon said:

"The law governing fire-escapes in hotels is a general law of the state. It is complete within

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itself, and imposes no duty whatever upon the municipality. The duty of inspection and enforcement is assumed by the state through its own agents; no act of the city could interfere therewith. There being no duty imposed upon the city to see that the state law governing fire-escapes was observed, it cannot be said that the city, in issuing a license to operate a hotel, thereby created a nuisance because such hotel was not so equipped."

City Held Liable for Injuries Inflicted by Animal in Zoo

A bear chained in defendant city's park injured plaintiff, a visitor, and the Mississippi Supreme Court decided that the city was liable. (Byrnes vs. City of Jackson, 105 Southern Reporter, 861.)

The city argued that maintaining a zoo in a municipal park is an educational, and therefore governmental, function, within the general rule that municipalities are not liable for injuries resulting from negligent performance of governmental functions. The Court said:

"There is no mandatory duty upon the city to either maintain a park or to keep a zoo therein. The right is permissive rather than mandatory, and we think when the city undertakes to maintain a zoo and keep therein dangerous and ferocious animals, it must be held to the strict duty of keeping them safely."

It was intimated that chaining the bear was an insufficient precaution for the safety of visitors; that the animal should have been placed in a cage or similar structure.

The Municipal Bond Market

THE total municipal financing for the first quarter of 1926 will about equal the total for the corresponding period of 1925, which amount was $310,195,255. Although the volume of all loans shows little change over last year's figures, it must be remembered that New York City sold $75,000,000 bonds in February, 1926, whereas there was no one block sold during the first three months of 1925 which might offset that amount. It will be concluded, therefore, that there were fewer borrowers in the 1926 market to date.

So far this year there has been an excellent demand for high-grade municipals and this is indicated in the prices paid for the new issues listed below.

A unique piece of public financing effected during the month of March was that of the Port of New York Authority, which sold $14,000,000 bonds. This was the initial offering of the Port Authority which was created by the Legislatures of the states of New York and New Jersey and ratified by Congress. However, the bonds are not an obligation of the states sanctioning them, neither are they a district issue, but are payable solely from revenues to be derived from bridge tolls. The bonds are free from Federal income taxes and are also a legal investment for savings banks and trust funds in the two states. The purpose of this initial financing by the Port Authority is the construction of two bridges which will connect Staten Island with the state of New Jersey.

The following is a list of the larger issues of bonds sold during the month of March:

Amount	Municipality	Maturity	Rate	Net Yield
$ 975,000	Minneapolis, Minn.	1927-1946	4 & 5	4.17
1,600,000	Yonkers, N. Y...	1927-1966	4½	4.19
720,000	Saginaw, Mich....	1927-1956	4½	4.22
979,000	Mercer Co., N. J.	1927-1946	4½	4.25
10,916,000	Cleveland, O.....	1926-1951	4½ & 4¾	4.26
2,000,000	Portland, Ore.....	1937-1956	4	4.33
750,000	Richmond Co., Ga.	1926-1955	4½	4.33
500,000	Dayton, O.....	1927-1951	4½	4.34
523,000	Port Chester, N.Y.	1927-1937	4½	4.34
540,000	Seattle, Wash.....	1928-1956	4½	4.41
1,500,000	Multnomah Co., Ore., Sch. Dist. No. 1	1929-1946	4½	4.42
750,000	Akron, O.....	1927-1951	4¾	4.43
1,777,700	New Orleans, La.	1928-1937	4½	4.43
1,389,500	Bossier Par., La., Con. Road Dist.	1927-1965	4½	4.49
14,000,000	Port of New York Authority, N. Y.	1932-1946	4½	4.76
450,000	Breitung Tp., Mich., Sch. Dist.	1927-1951	5¼	5.47
600,000	Hillsborough Co., Fla., Spec. Tax Sch. Dist. No. 45	1928-1952	5	6.14
554,000	Highlands Co., Fla.	1927-1956	5½ & 6	6.16

Standard Traffic Signs for Pittsburgh

A Supplementary Note to the Article on Page 429

Since this article was prepared, road tests have been made to determine the effectiveness of the various signs under actual driving conditions. Observations were made by citizen-drivers, going at a speed of about thirty miles per hour.

The following items were noted:

1. The distances at which the wordings could be read.
2. The distances at which the symbols were effective.
3. The effectiveness of the type and spacing of lettering.
4. The attention-value of the various colors.
5. The effectiveness of various sizes of signs.

In general the tests indicated that the signs were effective, but the following additional conclusions were reached:

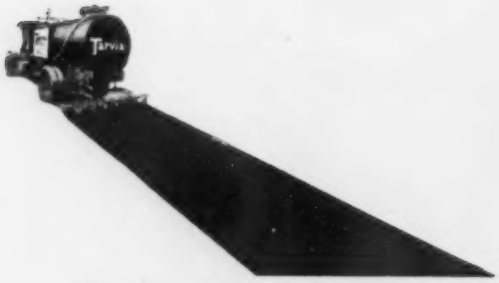
1. The sign sizes indicated in the article will be adhered to, for their additional effectiveness over smaller sizes.

2. One or two of the symbols, especially the automobile on the steep hill, were found to have too much detail and to lack effectiveness. Changes in these symbols will be made.

3. On the "Stop" sign, the words "Through" and "Traffic" will be decreased somewhat in size. In their present size they detract somewhat from the "punch" of the word "Stop."

4. Great value in the third color (the red cross) on the "Quiet Zone" sign was found.

5. A yellow color with a little orange in it, was thought to be more effective in attention value than a lemon yellow.



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Practical Water-Power Engineering: A Treatment of Technical and Commercial Factors; with Special Reference to Field Work Involving Study of Stream Flow, Pondage Capacity, Developed Waterways, Power Transmission Lines, etc.—By William T. Taylor, M. Amer. Soc. C. E., Consulting Engineer. D. Van Nostrand Company, New York. 1925. VII + 270 pp. Diagrams and tables. $10.00.

A very helpful book for municipal engineers in communities where water-power can be developed. The book has been prepared from experience in the field and with an endeavor to bring forward matter of prime importance and to point out the most particular conditions to be met with in water-power development. Designs of waterways such as gravity conduits and supply pipe lines are discussed and charts given to facilitate calculations for sizes. Turbine designs which really start and end at the factory are not treated. Careful treatment is given to conditions affecting the study and choice of sites, the location of hydraulic structures, and the economics of electric power commission. The fourteen chapters discuss: hydraulics and water-power development; catchment, rainfall, and run-off; selection of water-power sites; storage and pondage; stream flow, the gravity conduit; pressure pipe lines; hydraulic losses; automatically controlled small water-power plants; reporting on a water-power project; water legislation; high voltage power transmission; power transmission line calculations, and overhead electric power transmission economics.

Message from the Governor of New York State to the Legislature, Transmitting the Report of the Commission of Housing and Regional Planning for Permanent Housing Relief.—February 22, 1926. Legislative Document (1926) No. 66. 78 pp. A vigorous statement by the Governor as to the urgency of the problem and the necessity of immediate action by the Legislature in the creation of a State Housing Bank, precedes the report of the Commission. In discussing housing as a permanent problem the Commission shows the effect of congestion on health, family life, and morals, and states that public interest has now reached the stage where it must supply a sufficient quantity of standard housing at rates which two-thirds of the population can afford. The Commission then shows why unaided business enterprise cannot meet the housing needs of these families, and presents a study of the conditions prerequisite to any policy that attempts to cope with the problem, covering costs of land, of construction, and of operation. The proposed state housing law is explained, and the text of the proposed bill involving a State Board of Housing and a State Housing Bank follows. The legal opinion on the validity of the law is given, and also tables showing the itemized costs of different housing projects. (Apply to the Secretary of State, Albany, N. Y.)

Fresh Air and Ventilation.—By C.-E. A. Winslow, Professor of Public Health, Yale School of Medicine; Chairman, New York State Commission on Ventilation. E. P. Dutton & Company, New York. 1926. XI + 182 pp. $2.00.

The new science of ventilation maintains that the principal essential is the avoidance of over-heating. Recent investigation shows that air change, direction of flow, and other formerly over-estimated factors, are secondary. Scientific periodicals and technical monographs have held this information buried away from the layman, and this volume now presents the subject to the general reader, in order that he may learn how to maintain healthful atmospheric conditions in his immediate environment. The problems of factory ventilation and of the mitigation of industrial poisons are treated separately, and special attention is given to the danger of carbon monoxide poisoning.

American Society of Municipal Improvements.—Official Proceedings of the Thirty-first Annual Convention, held at Des Moines, Iowa, October 26-30, 1925. Published February 1, 1926. VII + 647 pp. Illustrated. $7.50. Valuable papers and discussion on street paving, design, maintenance, and cleaning; snow removal; city planning; public welfare; street lighting; sewerage, sanitation and garbage disposal; water-works; public safety; municipal legislation and finance; and municipal contract forms. (Apply to C. W. S. Sammelman, Secretary of the Society, 315 Commercial Building, St. Louis, Mo.)

National Conference on Street and Highway Safety.—Six reports issued in advance of the Second Conference, which was held in Washington, D. C., March 23-25, 1926. For copies, address the National Conference on Street and Highway Safety, Department of Commerce, Washington, D. C.

The Conference convened this year at the call of Secretary Hoover, by whom the committees had been appointed. The reports cover the following subjects: (A) Uniformity of Laws and Regulations, with suggested model for a uniform vehicle code, to consist of (I) "A Uniform Motor Vehicle Registration and Certificate of Title Act," (II) "A Uniform Motor Vehicle Operators' and Chauffeurs' License Act," and (III) "A Uniform Act Regulating the Operation of Vehicles on Highways;" (B) Enforcement; (C) Causes of Accidents; (D) Metropolitan Traffic Facilities; (E) Statistics; (F) Public Relations. For abstracts of the committee reports, see pages 422-429 of the 1926 Municipal Index.

The Town Hall Idea for Pittsburgh.—Pittsburgh's Need for a Public Auditorium. How a City Can Use Its Public Auditorium (a list of events that actually took place in the San Francisco Auditorium during 1925); Pittsburgh Newspaper Editors Unanimously in Favor of the "Town Hall" Idea (editorials from local papers); Public Auditoriums in Other Cities Are Proving Great Community Assets (reports from 64 American cities on the cost and operation of their auditoriums); with the resolution adopted by the Directors of the Chamber of Commerce of Pittsburgh, and by the membership of the Chamber, in December, endorsing the plans of the Town Hall Committee of the Chamber. 36 pp. Illustrated. (Apply to the Town Hall Committee, Chamber of Commerce of Pittsburgh, Seventh Avenue and Smithfield Street, Pittsburgh, Pa.)

Industrial Housing.—By Andrew J. Thomas. Published (December, 1925) by the Bayonne Housing Corporation, Bayonne, N. J., and describing the first low-priced housing undertaking of the Corporation. The houses were designed and built by Mr. Thomas. The buildings are well constructed, light, and airy, and two-thirds of the land area is devoted to garden, lawn, and playground. The Corporation receives no state aid, and limits its dividends to 5 per cent, receiving from these apartments a reasonable profit at monthly rents of from $9 to $10.25 a room. This pamphlet discusses the economics of industrial housing and the architecture of the garden apartment, and explains the principles upon which the Corporation operates. 61 pp. Illustrated. (Apply to Andrew J. Thomas, 15 East 47th Street, New York.)

American Society for Testing Materials.—Proceedings of the Twenty-eighth Annual Meeting, held at Atlantic City, N. J., June 23-25, 1925. In two parts. Part I contains 962 pp. (illustrated) and gives the annual reports of 35 committees of the Society with the discussion on them; also 83 tentative standards, either revised or published for the first time. Part II contains 454 pp. (illustrated) and gives 26 technical papers with discussion; the section on Metals includes papers on fatigue tests and corrosion tests of metals, and on the tensile properties of metals at high temperatures. There are a number of papers on cement, concrete, gypsum, brick, bituminous materials, paint, and textiles; also a paper on purchase of materials by specifications. Each Part: paper, $6.00; cloth, $6.50; half-leather, $8.00. (Apply to C. L. Warwick, Secretary-Treasurer of the Society, 1315 Spruce Street, Philadelphia, Pa.)

Memorandum and Diagrams re Hexagonal Planning, Traffic Intercepter and Orbit.—By Noulan Cauchon, President, Town Planning Institute of Canada. A paper presented at the joint meeting of the American City Planning Institute and the City Planning Division, American Society of Civil Engineers, January 22, 1926, as a further development of the theme submitted at the International Convention in New York, April 20, 1925. 6 pp. in the *Journal* of the Town Planning Institute of Canada for February, 1926. Illustrated. The principle discussed is submitted as affording a correlation of traffic that will obviate congestion and adjust environment to its human purpose—survival. (Apply to the *Journal*, Ottawa, Ont.)

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Depreciation in Public Utilities.—By Delos F. Wilcox. National Municipal League, 261 Broadway, New York. 1925. 112 pp. $2.00 postpaid.

This is the second in the National Municipal League Monograph Series. It discusses the relation of accrued depreciation to annual depreciation and maintenance, particularly as related to street railways. The depreciation practices of street railways in Chicago, Cleveland, Montreal, Grand Rapids, Milwaukee, New York, Boston, San Francisco, Seattle, and Detroit are given, and illustrate the confusion and lack of uniformity in such public utility administration which the author explains and deplores. Chapter II, "A Method for Arriving at Accrued Depreciation," presents directly and definitely the policies that the author believes should govern the relations between the public and the investors with respect to the capital account and accrued depreciation of, first, a property that is not growing, and, second, of one that is growing physically or financially.

Insuring Public School Property.—By William T. Melchior, Ph. D., Professor of Education, St. Lawrence University. Published by Teachers College, Columbia University, New York. 1925. XVII + 187 pp. Tables. $1.50.

An intensive report of insurance practices in school districts of New York State, containing also a general report from cities of the United States and a symposium by insurance executives. No. 168 of the Teachers Colleg Contributions to Education. The study reported in this volume was undertaken as a part of the work of the Educational Finance Inquiry Commission. It covers the following elements of the problem: how public school authorities are placing insurance on buildings, fixed improvements, contents, and motor vehicles, and how they are protecting against liability to the public and employees, other than workmen's compensation; the present expenditure for these types of insurance; the actual financial loss on school property and to school districts on account of injury to persons or to property other than school property; principles for insuring school property and for protecting against indemnity for employees and the public, and its cost; the relative advantages of carrying school insurance in private companies, or in private companies on certain types of risks, or for a school board to carry its own insurance.

Arson Activities in Fire Prevention.—Fire Prevention Bulletin Number Twenty-Three of the Insurance Department of the Chamber of Commerce of the United States, Washington, D. C. March 1, 1926. This number explains the field for chambers of commerce in preventing and punishing arson—working through an Arson Committee to secure effective arson laws, to investigate arson, and to stimulate public opinion for more vigorous prosecution and more effective sentences, by which means this sort of crime should be diminished. A suggested model arson law is presented, and the experience of Detroit's arson squad is given. (Apply to the publishers.)

The Sign Post.—The School Number (February, 1926) of this publication, issued monthly as a journal for public officials, by the Sign and Signal Division of the Lyle Culvert and Road Equipment Company, 171 27th Avenue S. E., Minneapolis, Minn. 4 large pp. This number deals almost exclusively with school safety programs and contains articles by H. P. Coffin, of the Public Safety Commission, Police Department, Portland, Ore., and Philip G. Lewis, Supervisor of Safety Patrols, Board of Public Education, Philadelphia, on the school safety work in their cities; also information about what the schools of Omaha, Seattle, and Minneapolis are doing along this line. Sent without charge to all who are interested in traffic control and city beautification. (Apply to the publishers.)

A Master Highway Plan at Detroit.—An address by Sidney D. Waldon, President, Detroit Rapid Transit Commission, delivered December 3, 1925, at the third annual meeting of the Chicago Regional Planning Association. 16 quarto pp. Illustrated. This gives a picture of what Detroit, in collaboration with the state of Michigan, the counties of Wayne, Oakland, and Macomb, and the adjacent municipalities, has planned in the way of a super-highway, what has been accomplished towards carrying it out, and how it will be financed; with a general discussion of the importance of such plans. (Apply to the Chicago Regional Planning Association, Burnham Building, Chicago, Ill.)

Twenty-Four-Hour Notification of Birth—A Realization.—By Julius Levy, M. D., Director of Division of Child Hygiene, Department of Health, Newark, N. J. In the November, 1925, issue of the *Monthly Bulletin* of the Department. 3 pp. This notification by midwives in Newark has been the means of giving the district nurses the opportunity to visit the new-born babies promptly and give assistance and instruction that have saved life. (Apply to the Department.)

Local Government in Many Lands.—By G. Montagu Harris, O. B. E., M. A., of the Middle Temple, Barrister-at-Law. P. S. King & Son, Ltd., London, England. 1926. VIII + 341 pp. 15 shillings.

This is a comparative study of all forms of public administration within subdivisions of the area of a sovereign state, whether the governing officials are of the state or are locally elected. The extent of local self-government is an important feature of the data. The countries studied are France, Belgium, Holland, Italy, Spain, Denmark, Sweden, Norway, Germany, Switzerland, the countries of eastern Europe, Great Britain and Ireland, the British Overseas dominions, the United States, and Japan. This is a most interesting volume for study and reference, furnishing the material for discovering remedies for difficulties that have confronted local governments in different places.

The New Civics.—By Roscoe Lewis Ashley. The Macmillan Company, New York. 1925. New and revised edition. XIX + 530 pp. Illustrated. $1.60 postpaid.

The new civics rests on a broad conception of our social system. This volume is designed to bring to advanced high school students an understanding of the responsibility which the citizen should assume and the cooperation he should render in public activities and the solving of public problems. It deals also with international relations. The text is arranged under three large divisions: The Citizen and Society, American Democratic Government (The People and Public Officials, Other Means of Popular Control, Civil Liberty and Social Justice, Public Finance, State and County Government, The National Constitution—Congress—Executive—Courts); Public Activities and Problems (education, health and welfare, labor and standards of living, industry, transportation, etc.). Throughout the book the author makes clear the principle that public needs must be satisfied by groups, organized and led to provide for the greatest possible development of all their members.

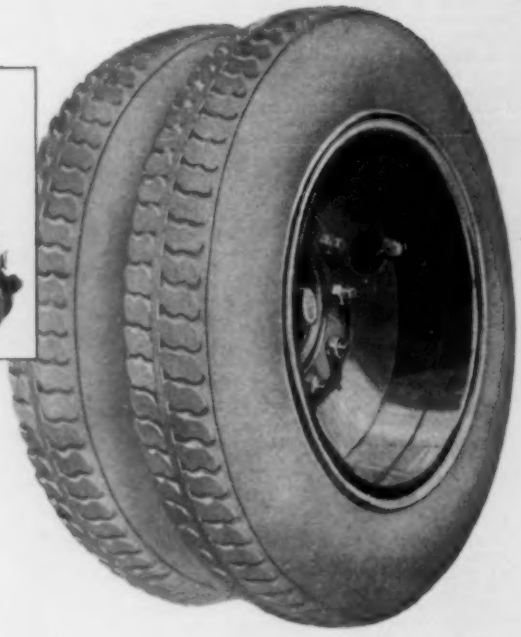
The Council-Manager Plan.—Three pamphlets prepared by the Chamber of Commerce of the City of Newark, N. J. 1. The Council-Manager Plan—What It Is and How It Works; 12 pp.; October, 1925. 2. The Story of Its Progress in the Important Cities of Dayton, Wichita, Grand Rapids, Norfolk, Knoxville, Portland, Maine, Cleveland, Fort Worth, Cincinnati, Kansas City, Rochester; 16 pp. December, 1925. 3. Representative Leaders in Industry, Government and Civic Affairs Endorse It; 6-page folder; February, 1926. (Apply to John B. Blandford, Secretary, Bureau of Research, Chamber of Commerce, Newark, N. J.)

Symposium on Residence Street Lighting.—A paper presented before the annual convention of the Illuminating Engineering Society, at Detroit, Mich., September, 1925. It consists of twelve solutions to a residence street-lighting problem which was sent (as herewith presented) to a selected list of engineers throughout the country who are interested in the subject of street lighting. 41 pp. Illustrated. Reprinted by the Holophane Glass Company, Inc., 342 Madison Avenue, New York, through the courtesy of the Illuminating Engineering Society. (Apply to the Holophane Glass Co.)

Legal Aid Work.—The March, 1926 issue of *The Annals* of the American Academy of Political and Social Science. Edited by John S. Bradway, Secretary, National Association of Legal Aid Organizations, and Reginald Heber Smith, Chairman of the Legal Aid Committee of the American Bar Association. An analysis and discussion of the various agencies developed in the United States for the purpose of securing legal justice to poor persons. Articles by authorities, arranged under the following divisions: Legal Aid Work in Civil Cases; Legal Aid Work in Criminal Cases. Special Agencies Affording Legal Aid; Legal Aid Contacts with Other Organizations; State-wide Legal Aid Systems; National and International Legal Aid Work. Paper, $2.00; cloth, $2.50. (Apply to the Academy, Box 4060, West Philadelphia Post Office, Philadelphia.)

Regulations of the National Board of Fire Underwriters for the Installation of Sprinkler Equipments.—Recommended by the National Fire Protection Association. 1925. Pocket size. 68 pp. Illustrated. The rules given cover only the general details of a sprinkler equipment. (Apply to National Board of Fire Underwriters, 76 William Street, New York.)

Plan Book of May Day-Child Health Day Celebrations.—Prepared by the American Child Health Association to offer individuals, schools, and communities concrete suggestions for giving through May Day serious thought and consideration to the protection and safeguards of child health and welfare. 20 pp. 10 cents. (Apply to the American Child Health Association, 370 Seventh Avenue, New York.)



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The Oradell Dam of the Hackensack Water Company.—By Nicholas S. Hill, Jr., M. Am., Soc. C. E., consulting engineer, New York. A paper presented November 4, 1925, to the American Society of Civil Engineers. Reprinted from *Proceedings*, October, 1925. 22 pp. Illustrated. This paper describes a unique type of dam of considerable size designed by the writer in 1911 and built by the Hackensack Water Company in 1920-22 to meet special conditions found at the site. (Apply to the author, 112 East 19th Street, New York.)

Discharge Records of North Carolina Streams, 1889-1923.—Prepared by the Water Resources Division, State Department of Conservation and Development. Thorndike Saville, Chief Hydraulic Engineer, G. Wallace Smith, Assistant Engineer. Bulletin No. 34 of the Department. The work is done in cooperation with the U. S. Geological Survey. Published 1925. 405 pp. Large folding map, charts, tables. The first publication of the kind to present tables of weekly stream flow, and duration curves of weekly stream flow for all long-term records. This will mean a great saving of time to engineers investigating stream flow for water-supply, water-power, or other purposes. (Apply to Wade H. Phillips, Director, North Carolina Department of Conservation and Development, Raleigh, N. C.)

Facts on Lake Levels.—Compiled by the Illinois Division of the Mississippi Valley Association. Published and distributed by The Chicago Association of Commerce. A pocket-size folder, bearing the statement "To those who oppose the Mississippi Diversion at Chicago, whether their opposition arise from honest conviction, misinformation, or selfish interest, it is suggested that before any stigma be laid upon Chicago, it is necessary to prove the facts herein to be in error." (Apply to The Chicago Association of Commerce, 10 South LaSalle Street, Chicago, Ill.)

The Architect and His City.—Excerpts from a paper by Dr. Raymond Unwin, F.R.I.B.A., presenting a development of the ideas he expressed in his address at the convention of the Royal Institute of British Architects in 1925, and reprinted from the *Journal* of the Institute. 4 quarto pp. It is a plea for mutual understanding between the artist and the practical man—"between the man who sees what might be and the man who knows what is." This reprint, February 10, 1926, is from the *Journal* of the American Institute of Architects, 250 West 57th Street, New York, to which apply.

The Present State of Court Decisions on Zoning.—By Alfred Bettman. Reprint of a paper given at the Ohio State Conference on City Planning, October, 1925. 12 pp. An authoritative statement of the validity of zoning in the city plan; showing, however, that the more carefully and thoroughly a zoning ordinance is prepared, based on a comprehensive survey and designed as a part of the carrying out of a more comprehensive city plan, the more likely is the ordinance to be upheld as constitutional. 10 cents; 500 or more copies at $55 per 1,000. (Apply to City Planning Publishing Co., 9 Park Street, Boston, Mass.)

Municipal Milk Supplies.—By Dr. R. W. Archibald, Bacteriologist, Division of Sanitation, Minnesota Department of Health. 8 pp. in the February, 1926, issue of *Minnesota Municipalities*, published by the League of Minnesota Municipalities, Minneapolis, Minn. Local supervision is essential to the assurance that municipal milk supplies are adequately safeguarded, yet there are 500 organized municipalities in Minnesota without milk ordinances. The ordinance of Hibbing, Minn., is given, and aid is offered to local authorities in the drafting of ordinances and in enforcing them. The one given has been drafted by the Division of Dairy Husbandry of the Department of Agriculture, University of Minnesota, the State Live Stock Sanitary Board, the State Dairy and Food Department, and the State Department of Health, and is adaptable to Minnesota municipalities not in Class I. It has been adopted by more than 80 municipalities. (Apply to the League.)

What Aviation Means to America.—Prepared by the Akron (Ohio) Chamber of Commerce in the interest of securing legislation by Congress to protect and develop aviation in the United States as a mark of commercial progress and as a means of national defense, and to promote the development of a municipal landing field and airport for Akron. 22 pp. Illustrated. (Apply to Akron Chamber of Commerce.)

Another Year's Damage Done by Autos.—By Robbins B. Stoeckel, Commissioner, State Department of Motor Vehicles, Hartford, Conn. Bulletin No. 28 of the Department. February 18, 1926. 8 pp. The increase in Connecticut motor-vehicle accidents during 1925 was 12.7 per cent less that that of the previous year, yet the number of persons killed and the property damage totals soared higher. (Apply to author.)

Municipal Aesthetics and the Law.—By Newman F. Baker, Special Assistant Corporation Counsel, City of Chicago; Graduate Fellow, University of Chicago Law School. 27 pp. in *Illinois Law Review*, February, 1926, edited by the Law Schools of the University of Chicago, the University of Illinois, and Northwestern University. Published by Northwestern University Press, 31 West Lake Street, Chicago, Ill. 75 cents. Beauty has become a matter of community concern. How this concern has been dealt with by the courts is summarized in this valuable article under the following heads: Changing Urban Conditions; Municipal Aesthetics in Europe; Municipal Aesthetics and Eminent Domain; Municipal Aesthetics and Taxation; Promotion of Aesthetics on City Property; The Use of the Police Power to Promote Beauty; Regulation of the Height of Buildings; Bill-Board Regulation; City Planning and Zoning; Changing Concept of Police Power.

Grade Crossing Elimination, Dayton, Ohio.—The Improvement of Railroad Conditions in Dayton. A report by the Technical Advisory Corporation, of New York, to the City Plan Board of Dayton, submitted by the Board to the City Commission, September 21, 1925. 71 quarto pp. Views, plans, maps. The situation has been studied in connection with the solving of the related problems of the rectification of the street system; the provision of additional thoroughfares; the reclamation of certain areas; the provision of additional trade and industrial areas; and the preservation of the character of certain residential areas. The solution is presented as involving a minimum of cost to the railroads and the city, and including the improvement of operating conditions. (Apply to the Technical Advisory Corporation, 15 Park Row, New York.)

Toward an Understanding of the Metropolis.—Some Speculations Regarding the Economic Basis of Urban Concentration. By Robert M. Haig, Director, Economic and Industrial Survey, Regional Plan of New York and Its Environs. Reprinted from the *Quarterly Journal of Economics* for February, 1926, for the Committee on a Regional Plan of New York and Its Environs, 130 East 22nd Street, New York. 30 pp. "Managing and administering, buying and selling, financing and risk-bearing, investigating and advising—these are among the functions which find the city very congenial indeed. However, a considerable part of the processes of fabrication, of preparing materials for human consumption, can be and are carried on more economically outside the urban centers." (Apply to the Regional Plan of New York and Its Environs.)

Building Code, Santa Barbara, Calif.—Ordinance No. 1278, effective January 18, 1926. Prepared by City Planning Commission, Architectural Advisory Committee, Builders Exchange, Building Trades Council, Francis Price, City Attorney, Vern D. Hedden, Consultant 156 pp. The Plans and Planting Committee of the Community Arts Association of Santa Barbara believes that, with this law in effect—drawn without regard to commercial affiliation or political preferment, and as close to fool-proof and to disaster-proof as it appeared humanly possible to make it—a catastrophe due to structural weaknesses cannot again occur in Santa Barbara. Readers of The American City will recall the vigorous article by Charley H. Cheney, Consultant to the Santa Barbara City Planning Commission, on this subject, entitled "Ten-Million-Dollar Loss Due to No Building Code," in the October, 1925, issue. (Apply to City Clerk.)

Ottawa Suburban Roads Commission.—Annual Report of the Engineer for the year 1925. Loose-leaf, specially prepared report, with actual photographs mounted. A unique and most attractive document, presenting valuable cost figures. (Apply to Alan K. Hay, Engineer of the Commission, Ottawa, Ont.)

Provisions for Care of the Aged.—A selected bibliography. The February, 1926, issue of the *Bulletin* of the Russell Sage Foundation Library, 130 East 22nd Street, New York. 4 pp. 10 cents. (Apply to the Library.)

Reports Received

CINCINNATI, OHIO.—Report of the Water-Works, for 1922, 1923, 1924

KALISPELL, MONT.—Annual Report, Water Department, 1925

NEWTON, MASS.—Annual Report, City Engineer, 1924

OAK PARK, ILL.—Annual Report, Department of Public Works, 1925.

ST. PAUL, MINN.—Annual Report, Commissioner of Public Works, 1924

TORONTO, ONT.—Annual Report, Assessment Commissioner, 1925.

WESTCHESTER COUNTY, N. Y.—Annual Report, Recreation Commission, 1925

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On the Calendar of Conventions

APRIL 12.—NEW YORK
National Committee on Prisons and Prison Labor. Annual meeting. Secretary, Miss Julia K. Jaffray, 4 West 57th Street, New York.

APRIL 14-16.—KANSAS CITY, MO.
American Society of Civil Engineers. Spring meeting. Secretary, George T. Seabury, 33 West 39th Street, New York.

APRIL 17-30.—COLUMBUS, OHIO
Building Officials' Conference. Annual meeting. Secretary, Jeremiah F. Downey, City Hall, Cambridge, Mass.

APRIL 27-29.—JACKSONVILLE BEACH, FLA.
Southeastern Water and Light Association. Annual meeting. Secretary, W. F. Stieglitz, Columbia, S. C.

MAY 3-7.—TORONTO, ONT.
Canadian Public Health Association. Annual meeting. General Secretary, J. T. Phair, Spadina House, Toronto, Ont.

MAY 5-7.—WASHINGTON, D. C.
American Institute of Architects. Annual meeting. Executive Secretary, E. C. Kemper, The Octagon, Washington, D. C.

MAY 10-13.—ATLANTIC CITY, N. J.
National Fire Protection Association. Annual meeting. Secretary, Franklin H. Wentworth, 40 Central Street, Boston, Mass.

MAY 11.—WASHINGTON, D. C.
National Association of Commercial Organisation Secretaries. Mid-year meeting. Secretary-Treasurer, Walter O. Lochner, Chamber of Commerce, Trenton, N. J.

MAY 11-13.—WASHINGTON, D. C.
Chamber of Commerce of the United States of America. Annual meeting. Secretary, D. A. Skinner, 1615 H Street N. W., Washington, D. C.

MAY 12-14.—WASHINGTON, D. C.
American Federation of Arts. Annual meeting. Secretary, Miss Leila Mechlin, 1741 New York Avenue, Washington, D. C.

MAY 12-15.—NEWARK, N. J.
American Physical Education Association. Annual convention. Secretary, Dr. J. H. McCurdy, Box G, Highland Station, Springfield, Mass.

MAY 13-15.—WASHINGTON, D. C.
Southern Commercial Secretaries Association. Annual meeting. Secretary, B. S. Barker, Atlanta, Ga.

WEEK OF MAY 17.—ATLANTIC CITY, N. J.
American Health Congress. Address: Sally Durham Hanshue, Secretary, Committee on General Arrangements, National Health Council, 370 7th Avenue, New York.

MAY 17-20.—NEW YORK
American Association of Museums. Annual convention. Executive Secretary, Laurence Vail Coleman, 2 West 46th Street, New York.

MAY 17-22.—ATLANTIC CITY N. J.
American Child Health Association. Joining in American Health Congress. Secretary, Dr. Philip Van Ingen, 370 Seventh Avenue, New York.

MAY 23-26.—CLEVELAND, OHIO.
International Association of Policewomen. Annual meeting. President, Mrs. Mina C. Van Winkle, 420 Evening Star Building, Washington, D. C.

MAY 24-25.—WASHINGTON, D. C.
Conference of State and Territorial Health Authorities. Annual conference. Address: United States Public Health Service, Washington, D. C.

MAY 24-JUNE 5.—ATLANTIC CITY, N. J.
General Federation of Women's Clubs. Biennial convention. Address: 1734 N Street N. W., Washington, D. C.

MAY 25-26.—CORPUS CHRISTI, TEXAS
League of Texas Municipalities. Annual convention. Executive Secretary, 815-½ Capitol Avenue, Houston, Tex.

MAY 26-JUNE 3.—CLEVELAND, OHIO
American Association for Community Organization. Annual conference. Executive Director, Allen T. Burns, 215 Fourth Avenue, New York.

MAY 26-JUNE 3.—CLEVELAND, OHIO.
National Conference of Social Work. Annual conference. Secretary, William H. Parker, 25 East 9th Street, Cincinnati, Ohio.

JUNE 5-7.—BUFFALO, N. Y.
Conference of State Sanitary Engineers. Annual meeting. Secretary-Treasurer, Arthur P. Miller, Assistant Sanitary Engineer, U. S. Public Health Service, Washington, D. C.

JUNE 7-11.—BUFFALO, N. Y.
American Water Works Association. Annual meeting. Secretary, Beekman C. Little, 43 City Hall, Rochester, N. Y.

JUNE 8-11.—TULSA, OKLA.
National Association of Real Estate Boards. Annual convention. Executive Secretary, Herbert U. Nelson, 310 South Michigan Avenue, Chicago, Ill.

JUNE 9-12.—LOS ANGELES, CALIF.
National Association of Purchasing Agents. Annual convention and Informashow. Secretary, W. L. Chandler, Woolworth Building, New York.

JUNE 12-18.—PHILADELPHIA, PA.
American Association of Engineers. Annual convention. Acting Secretary, Miss M. E. McIver, 63 East Adams Street, Chicago, Ill.

JUNE 14-16.—HOT SPRINGS, ARK.
National Conference on State Parks. Annual meeting. Secretary, Beatrice M. Ward, 905 Union Trust Building, Washington, D. C.

JUNE 16-18.—SCHENECTADY, N. Y.
Conference of Mayors and Other City Officials of the State of New York. Annual conference. Secretary, William P. Capes, City Hall, Albany, N. Y.

JUNE 21-25.—ATLANTIC CITY, N. J.
American Society for Testing Materials. Annual meeting. Secretary, C. L. Warwick, 1315 Spruce Street, Philadelphia, Pa.

JUNE 22-24.—MANCHESTER, N. H.
New England Association of Fire Chiefs. Annual convention. Secretary, Chief John W. O'Hearn, Watertown, Mass.

JUNE 23-25.—VIRGINIA, MINN.
League of Minnesota Municipalities. Annual meeting. Executive Secretary, Morris B. Lambie, University of Minnesota Library, Minneapolis, Minn.

JUNE 28-JULY 1.—SAN FRANCISCO, CALIF.
American Society of Mechanical Engineers. Spring meeting. Secretary, Calvin W. Rice, 29 West 39th Street, New York.

JUNE 28-JULY 1.—MILWAUKEE, WIS.
Smoke Prevention Association. Annual convention. Secretary, Frank A. Chambers, Room 1411, City Hall, Chicago, Ill.

AUGUST 16-28.—EVANSTON, ILL.
National School for Commercial and Trade Executives. Address: John N. Van der Vries, Chamber of Commerce of the United States, 801 Otis Building, Chicago, Ill.

SEPTEMBER.—VIENNA, AUSTRIA
International Conference on Housing and Town Planning. Address: H. Chapman, Organizing Secretary, International Federation for Town and Country Planning and Garden Cities, 3 Gray's Inn Place, London, W. C. 1, England.

OCTOBER 4-8.—CLEVELAND OHIO
American Electric Railway Association. Annual convention and Manufacturers' Exhibit. Executive Secretary, J. W. Welsh, 292 Madison Avenue, New York.

OCTOBER 19-22.—NEW ORLEANS, LA.
International Association of Fire Engineers. Annual convention. Secretary, James J. Mulcahey, City Hall, Yonkers, N. Y.

OCTOBER 24-27.—PITTSBURGH, PA.
National Association of Commercial Organisation Secretaries. Annual meeting. Secretary-Treasurer, Walter O. Lochner, Chamber of Commerce, Trenton, N. J.

OCTOBER 25-29.—DETROIT MICH.
National Safety Council. Annual Safety Congress. Managing Director, W. H. Cameron, 168 North Michigan Avenue, Chicago, Ill.

NOVEMBER 8-12.—WASHINGTON, D. C.
American Society for Municipal Improvements. Secretary, C. W. Sammelman, 3317 Olive Street, St. Louis, Mo.

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News and Illustrations

Items of Interest to City, Town and County Officials, and Others Concerned with the Economical Construction and Efficient Operation of Public Improvement Undertakings

A Heavier One-Man Power Grader

The chief feature of the new 15-30 Austin-International motor grader sold by the Austin-Western Road Machinery Company, 400 North Michigan Avenue, Chicago, Ill., is that it has weight and power enough to cut right down to the bottoms of the corrugations of a badly rutted gravel road; for which reason the manufacturers state that it can be called a reconstruction as well as a maintenance machine because the blade cuts an entirely new and smooth surface over which the loosened gravel is evenly distributed.

While larger and more powerful than earlier motor graders, the 15-30 Austin International is easy to operate, because of such features as adjustable blade-raising springs, leaning front wheels, and rubber-tired traction wheels. This machine has sufficient speed and blade length to make its operating cost quite low, and its surplus power tends to lengthen the life of both the motor and the grader and thus decrease yearly up-keep cost.

A less powerful unit, known as the 10-20 grader, has been developed as a road maintainer and is especially adapted to township, county, and municipal work where road widths are less than on state highways and where the distances to be covered are not as great.

The wheel-base is 18 feet 10 inches, the length over-all 22 feet 8 inches; height over-all 8 feet 7 inches; blade 12 feet long, 17 inches wide; blade side shift 12 inches each way; blade clearance 12 inches.

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Bowden Establishes Agency in Cleveland

George T. Bowden, formerly with T. H. Ball & Staff, is now established at Room 201, 6007 Euclid Avenue, Cleveland, Ohio, where he has his own agency to handle trade paper advertising.

Well-known Consulting Engineers Reorganize

Following the sad death of Leonard Metcalf, whose work in the sanitary engineering field is known throughout the continent, the partnership of Metcalf & Eddy was dissolved and a new partnership of the same name formed by the surviving partners with the addition of Harrison P. Eddy, Jr. Metcalf & Eddy, 14 Beacon Street, Boston, Mass., will continue the professional practice of engineering, the partners consisting of Harrison P. Eddy, Charles W. Sherman, Almon L. Fales, Frank A. Marston, John P. Wentworth, and Harrison P. Eddy, Jr.

Still good after 19 years!

Since Trinidad Native-Lake Asphalt was laid in 1907 on Bull Street Savannah, Georgia (photo shows vied north from State Street), it has been subjected to a steady stream of traffic—and it is still in excellent condition—*with practically no cost for maintenance to date.*

Trinidad holds the record for long life because it is a native-lake asphalt—possessing qualities which cannot be put into artificially-produced products. In addition, Trinidad is attractive, resilient, easy to keep clean, easy to repair, and costs less for maintenance than any other bituminous paving material.

The demands of *road* building are met to the best advantage with Bermudez Road Asphalt—another native-lake product. Write us for interesting data.

The Barber Asphalt Company

Philadelphia

New York Chicago Pittsburgh St. Louis Kansas City San Francisco

TRINIDAD LAKE ASPHALT

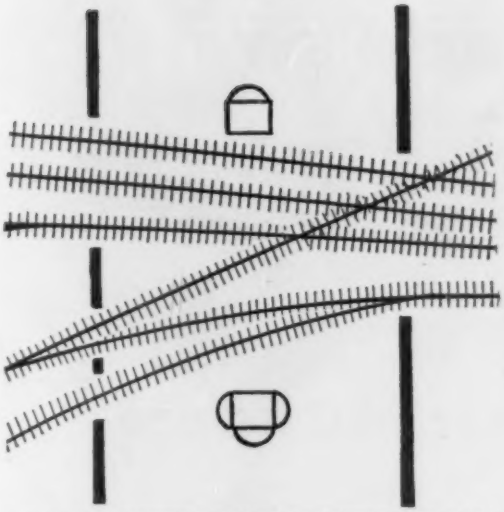


DIAGRAM SHOWING GRADE CROSSING AND LOCATION OF SIGNALS

A Neat Solution of a Difficult Traffic Problem

The diagram below represents the installation of a traffic signal system at a railroad crossing where a heavy traffic thoroughfare crosses two main lines of passenger tracks and four freight tracks. Vehicular and pedestrian traffic and freight and switching train operation are controlled without interfering with fast passenger trains, through the use of equipment made by the Crouse-Hinds Company, Syracuse, N. Y.

This control is accomplished by the use of two Type-TSP Crouse-Hinds traffic signals equipped with bells. These signals are controlled by a manually operated switch with telltale lamps in series with the signal lamps placed above the switch, which is located in the flagman's house.

3-WAY SIGNAL

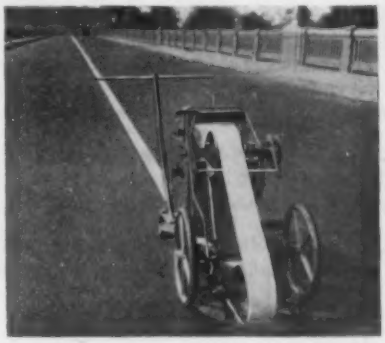
When the red lights show in the direction of vehicular and pedestrian traffic, the bells ring continuously. The signal located near the mainline tracks is a one-way signal which displays no colors along the tracks but shows along approaching streets. The other signal is a three-way signal and displays colors in the direction of the approaching streets, and also in both directions along the freight and switching tracks. Thus freight - train movements as well as the movements of vehicles and pedestrians are controlled.

A Zone-Painting Machine with Adequate Control

A new machine for painting traffic or zone lines, either straight, curved, in angles, or dotted, has been developed by the Continental Products Company, Euclid, Ohio. The control of the feeding of the paint in the Continental zone-painting machine is accomplished by an aluminum wheel revolving in the paint-tank as the machine moves. This feed-wheel lays the paint evenly on an endless soft rubber belt which carries it down and applies it to the pavement. By this means, sprays, compressed air, gravity feed, forced feed, pipe lines, and hose connections with their opportunities for clogging are eliminated.

Uniform application of the paint is obtained by traction pressure of the soft rubber belt as it comes in contact with the pavement. The manufacturers claim that spraying or any other means of application merely lays the paint on the surface and does not amalgamate it with the pavement. This machine can be used on long highway stretches or short city zone-marking equally effectively.

Moving the machine from one job to another is an easy matter. It is built of aluminum and weighs only 200 pounds; hence it can be lifted onto a truck. If the distance is short, it can be pushed along the pavement.



ZONE-PAINTING MACHINE OPERATING ON WILLOUGHBY BRIDGE, WILLOUGHBY, OHIO

The Continental Products Company states that any good, heavy paint can be used in the machine, but that Continental street-marking paint, which is a luminous white and dries in from 10 to 30 minutes and stays white on asphalt, has been developed specially for this service.

Monahan to Represent Chicago Pump Company in East

The Chicago Pump Company, 2336 Wolfram Street, Chicago, Ill., has announced that Joseph J. Monahan, Monahan Pump Equipment Company, 200 Devonshire Street, Boston, Mass., will act as Eastern New England sales agent for the entire line of pumps manufactured by the Chicago company. This line of pumping equipment includes those used in the industrial and building fields, such as general supply, boiler feed, condensation, vacuum, sewage disposal, and bilge pumps.

These features give

GMC Big Brute

ECONOMY

No Truck has ever had before

Two-Range Transmission: Provides a power transmitting unit which assures **economical operation under any and all conditions.**

Removable Cylinders: Each cylinder is a *separate removable sleeve,* and can therefore be accurately machined to even thickness on both sides. Expansion and contraction are therefore equal in all parts. Also this feature insures a continuous close-running fit of the pistons.

It is a matter of only a **few hours to remove and replace a cylinder,** and it is unnecessary to remove or rebore the entire cylinder block—an operation extremely costly in service charges and time lost by the truck.

Removable Valve Lifter Assembly: Permits removing the valve lifters and rollers by taking out four cap screws. With assembly removed access to the crank case is possible without removing the oil pan.

Air Cleaner: Filters the air to carburetor and engine preventing harmful dirt and grit from reaching the engine's working surfaces.

Pressure Lubrication to all bearing points provides a constant, unfailing film of oil over all working parts.

Cooling System is a combination pump and thermo-syphon type. The circulation of water by pump is first along the valve seats, the hottest points, then into the head, over combustion chambers, around spark plug bosses and back through the radiator. The circulation through the cylinder jackets is by thermo-syphon system. This combination system results in very **even cooling, without over cooling the engine.**

Products of
Yellow Truck and Coach Manufacturing Company
subsidiary of General Motors
GMC Big Brute, 3½ and 5 ton trucks - GMC 1, 1½ and 2½ ton trucks
Yellow Cabs - Yellow Coaches - Yellow Light Delivery Trucks
Hertz Drivurself Cars - GMC 5 to 15 ton Tractors

A General Motors Product

Sold and Serviced Everywhere by Branches, Distributors and Dealers of

GENERAL MOTORS TRUCK COMPANY, PONTIAC, MICHIGAN

A DIVISION OF YELLOW TRUCK AND COACH MANUFACTURING COMPANY

McCORMICK-DEERING TRACTOR HANDLING SNOW REMOVAL IN OMAHA, NEBR.

Many Uses for Tractors by Municipalities

Tractors have been performing a big work this winter in snow removal by large cities. In the accompanying illustration is shown a McCormick-Deering industrial tractor made by the International Harvester Company, 606 South Michigan Avenue, Chicago, Ill., with road-maintaining and grading equipment, which has been drafted by the city of Omaha for clearing snow, especially from its bridges and boulevards, where heavy snowbanks tend to accumulate.

While this outfit was purchased primarily for summer work, it has been doing the job of snow removal with efficiency and dispatch. Because of the length of blade and the six wheels, the outfit stays on the ground at all times, even when bucking large drifts. With a scarifier on the rear of the tractor, icy surfaces can be easily broken up and cleared away.

Tractors of the type shown are being used in ever increasing numbers by municipalities, not only for operating special attachments such as shown—rollers, road crowners, scrapers, backfillers, special loaders, lawn-mowers, etc., but also for pulling trains of trailers for hauling garbage, refuse, dirt, gravel, and so on. They operate at speeds up to ten miles an hour, and frequently are called three-purpose tractors in that they may be used for hauling, for stationery belt work, if desired, and for operating special attachments through a power-take-off device.

Makers of Oiljaks Move to New Offices

The Oil Jack Company, Inc., has announced the removal of its general sales offices from 1457 Broadway, New York, to 110 West 40th Street, New York.

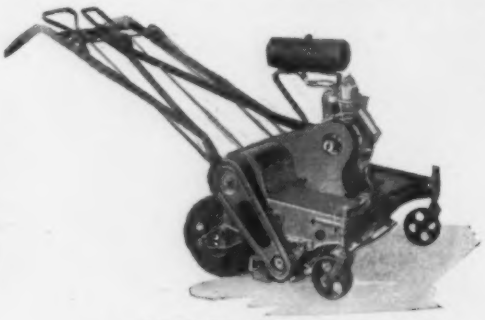
A Portable Hoist for Fordson Operation

A powerful, durable, winding drum hoist, either single- or double-drum, reversing or non-reversing, is produced by Pioneers Tractors, Inc., Winona, Minn., in its Porta-Hoist, which is readily bolted to the front of a Fordson tractor and operated by a belt from the Fordson pulley.

The Pioneer Porta-Hoist is assembled in a one-piece rigid main housing casting which carries the transmisson gear case and bearing housing for the shafting, thus insuring perfect alignment of the working parts, as well as ease of attachment. The main drum is 8 inches in diameter and 14 inches long between flanges, and rotates free on the drum-shaft on bronze bushings. The brake drum is of large capacity and the ratchet teeth for the positive locking dog are cast integral with the drum flange on one end, and clutch friction blocks in four sections bolt to the drum flange on the opposite end.

The mean cable speed with standard drive is 140 feet per minute, with a lifing capacity of 73,500 pounds on a single line for continuous operation. A lifting capacity of over 4,000 pounds of single line is possible for occasional heavy loads, and by a reduction in speed a still greater load can be raised, as this hoist is designed sufficiently rugged to withstand loads in excess of 5,000 pounds.

The hoist is mounted on two rigid steel channels secured to the Fordson tractor by a special bracket casting attached at the joint between the motor and transmission housing and supported in front by a pedestal casting of rugged design through which the front-axle king-bolt passes. This mounting places practically the entire weight of the hoist on the front axle and wheels and eliminates strains on any tractor castings. The



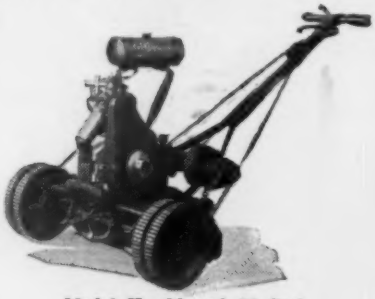
Model RO—30 Inch

BOLENS
POWER MOWERS

are made in two styles: Model RO with roller and cutting unit combined and Model K, which is a wheel type mower.

The BOLENS Model RO can be converted to the wheel type by removing the four inner segments of the roller. It also has a separate clutch, so the outfit can be transported with the reel idle.

Both types have double clutch drive for guiding and turning under power. Many other distinctive features.



Model K—22 and 30 Inch

Write for full particulars.

Gilson Mfg. Co., 563 Park St., Port Washington, Wis.

Stone and Webster Use Six Novo Hoists on Big Power House Job

SIX Novo LH Hoists are being used by Stone & Webster in constructing the new Philadelphia Electric Company plant at Philadelphia. This plant, one of the largest in the world, will have a generating capacity of more than a million horse power. The buildings are approximately 100 feet high. The Novo LH Hoists place form lumber and reinforcing steel in the upper stories.

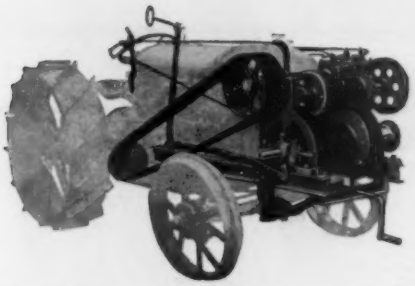
Stone and Webster know industrial equipment. What they use must do the work. That is why they use Novo Hoists.

NOVO HOISTS—Single and double drum, electric motor and gasoline drive, for pile-driving, steel-setting, clamshell bucket, platform elevators, concrete chuting equipment, etc.

NOVO ENGINES—1½ to 40 H.P.

NOVO PUMPS—Centrifugal, diaphragm and force.

NOVO ENGINE CO.
Clarence E. Bement, Vice-Pres. & Gen. Mgr.
LANSING — MICHIGAN



DOUBLE-DRUM HOIST MOUNTED ON FRONT OF FORDSON

clearance under the tractor is not reduced by the Porta-Hoist attachment. Extension of the starting crank is furnished by the manufacturers, permitting cranking of the motor in front of the hoist.

The Porta-Hoist has been used for many types of contracting work, among the most interesting being the operation of double-cage material elevators to eliminate hand labor and speed up building operations, operating an excavating bucket or boom and operating a standard type pile hammer with a 1,600-pound hammer.

A Heavy-Duty Dump-Truck to Meet New Needs

A new heavy-duty Model-52-D dump-truck, built along the general lines of the White Model-45-D, but with many refinements, has been announced by The White Company, Cleveland, Ohio. The purpose of this new model is to meet changing conditions in the industry with a truck that anticipates the highly developed demands of dump-truck transportation. This truck has an auxiliary transmission affording the equivalent of five speeds, giving extra low-gear pulling power for hill climbing and getting out of holes or mire, a new dumping mechanism and tapered dump body, an improved and patented oil system, and the exclusive White double reduction gear drive.

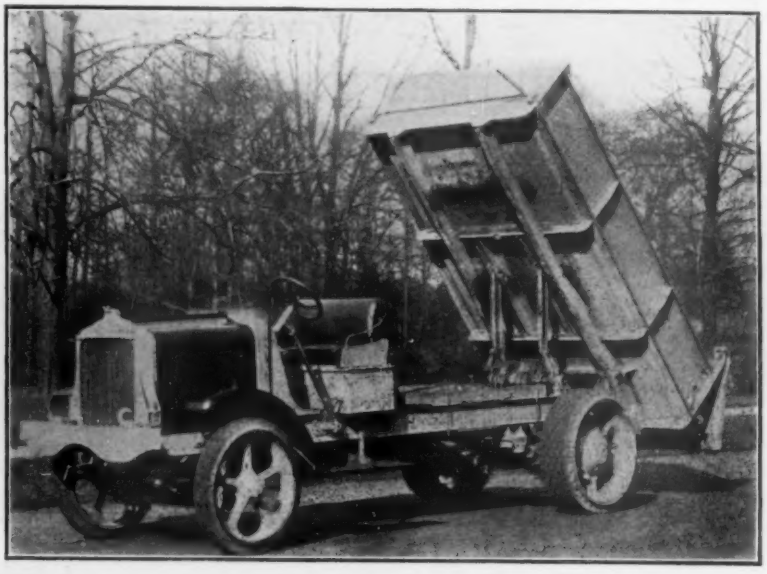
Other new features include a large tubular type radiator, spring cradles on the frame, a wide, heavy, pressed-steel bumper, heavier, easy-working steering gear, an air temperature regulator that saves fuel and adds to engine efficiency in all speeds, heavy springs, a reinforced frame of chrome nickel steel, and brakes with drums of a special metal that insures quick, certain stopping and long brake-life.

Incorporated in the same case with the auxiliary transmission is the mechanism which operates the dumping hoist. The tapered dump body is raised on arms and links by means of a speedy and positive gear drive, which lifts the body to an angle greater than 50 degrees, dumping the load clean. The body is under positive control at all positions and may be held at any angle. It is lowered by the same mechanism that hoists it but can be lowered while the truck is in motion on its way back for another load. At normal rest position and at the extreme dumping angle, the body is automatically stopped.

The body is mounted so that the load weight is properly distributed, and the dumping point is so far back that the load slides neatly over the edge of a soft fill without danger of miring the truck, or piles up clear of the truck on flat ground. A double-acting tail-gate further facilitates dumping, and low body sides make loading from the ground exceptionally easy. The dumping mechanism is set solidly down in the frame in a dirt-proof and weather-proof housing, the gears running in oil. The wheel-base is 156 inches, and the truck is equipped with 36 x 6 solid front tires, and 40 x 12 solid rear tires.

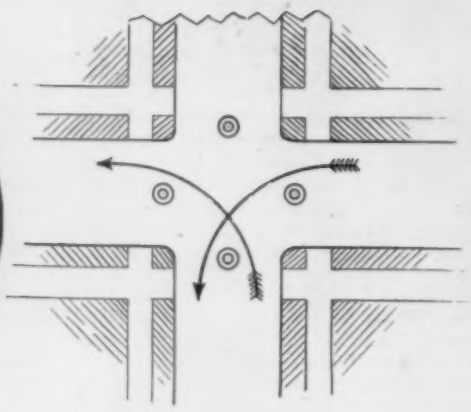
Merger of Two Fire-Hose Companies

Through a merger of the financial interests of the Hewitt Rubber Company, Buffalo, N. Y., with the Gutta Percha and Rubber Manufacturing Company of New York and Brooklyn, two well-known hose manufacturing companies have become one. The plant of the Gutta Percha and Rubber Manufacturing Company in Brooklyn will be moved to Buffalo, which has become quite a rubber center. Among the well-known products of the Gutta Percha and Rubber Manufacturing Company is Maltese Cross fire-hose, which is standard equipment in many municipal fire departments.



NEW WHITE MODEL 52-B HEAVY-DUTY DUMP-TRUCK WITH BODY IN DUMPING POSITION

Cretney Traffic Guides



THE Cretney four Marker System is less than 3 years old and is meeting with such general favor that it is safe to predict that in a very short time every up-to-date city will divide traffic at the crosswalk.

The elderly lady or woman with a baby carriage feels secure while crossing the street where there is a divider for traffic at the crosswalk.

City officials with the safety of the pedestrian at heart readily see the importance of dividing traffic in this way.

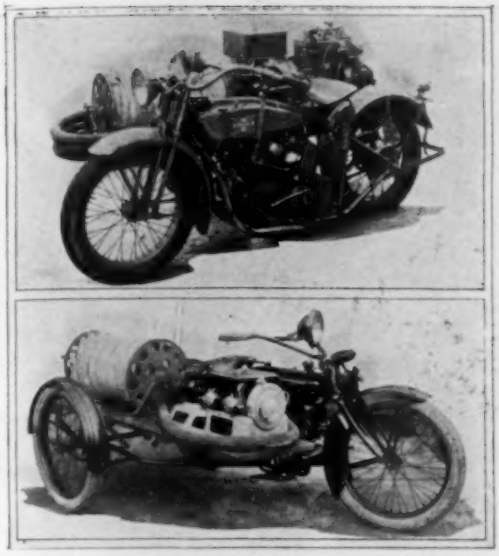
Our Guides are READILY seen day or night—MALLEABLE iron—RAISED letters—PERMANENT fixtures—ARE PRICED RIGHT—DO THE WORK—and being less than 3 inches high are NOT an obstruction.

The Arterial Stop Sign should be placed at the approach to an arterial instead of one of the traffic guides. It will be seen more readily than the sign on the post at the side, but even where the post at the side is used, this stop should be placed on the street for an additional precaution as well as a divider for the traffic.

Write for catalog.

CRETNEY TRAFFIC GUIDE CO.

Madison, Wisconsin



HEAVY- AND LIGHT-DUTY MOTORCYCLE FIRE EQUIPMENT

A New Piece of Fire Department Equipment

Small towns and volunteer fire departments will be particularly interested in the new motorcycle pumping engine which has been developed by the Northern Pump Company, Minneapolis, Minn. The machine is made in two different styles, both of which are compact and able to cover ground very rapidly.

The first unit is a heavier machine built on a side-car motorcycle carrying a Model 364 Northern pumping engine which was originally developed for the Minnesota State Forestry Department as a heavy-duty forest-fire engine. It is capable of delivering 75 gallons of water per minute at high pressure and weighs only 500 pounds, including the engine. It will draw water 25 feet without preliminary priming. As mounted on the side-car motorcycle it is equipped with two lengths of suction hose, one containing a strainer, and a reel carrying 500 feet of 2-inch linen hose.

The unit is arranged particularly well, being very easily accessible. The starting crank is located at the front of the machine, while the hose can be run off in almost any direction. This unit is particularly good for reaching fire in comparatively inaccessible points, as it is so compact that it can run through narrow alleys or on roads which might prove disastrous for heavy equipment.

The lighter type of side-car pumping engine is shown in the second illustration. This machine is similar to the first, but is more limited in its service.

New Destructor Under Construction in Buffalo

The new Heenan destructor being built for the city of Buffalo by the Hiler Engineering and Construction Company, Inc., 122 Livingston Street, Brooklyn, N. Y., is described and illustrated in the January, 1926, issue of *Rubbish*, an interesting house organ published occasionally by the Hiler Engineering and Construction Company.

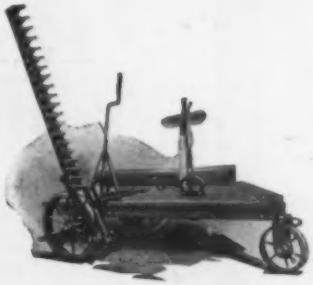
The new Buffalo plant will be located at Cheektowaga, just across the city line, and will have a capacity to burn 500 tons of refuse every 24 hours. The plant is to cost $459,000. The destructor is of the top-feed, high-temperature, mutual-assistance grate type with side units of four cells each, every cell capable of destroying 25 tons of refuse every 24 hours.

The building housing the destructor will be 212 feet long by 81 feet wide, with ground tipping and charging floor and ramps for trucks arriving and departing.

All-Steel Highway Mowers

The need for a machine which could be readily hauled by motor trucks or a tractor along the shoulder of a highway, to cut weeds, led to the development of the Rawls all-steel highway mower by the Rawls Machine and Manufacturing Works, Chicago, Ill. Highways in 20 states and on more than 100 railroads in eight different countries are users of this mowing equipment.

The Rawls all-steel highway mower has a maximum speed of 6 to 8 miles per hour, which is equivalent to the service of three or four farm mowers with the operating expense of two or



THE RAWLS HIGHWAY MOWER

three eliminated. It will cut 6 feet below the road-bed, and the cutter bar is easily and instantly adjusted for cutting levels, or inclines up or down. If the cutter bar strikes a stump or other obstruction, it automatically demounts without injury and can be replaced in a few minutes.

The manufacturers have endeavored to design this equipment for maximum efficiency, and use high-grade, wear-resisting materials to insure long, trouble-proof, and economical service.

Westinghouse Starts Hollowspun Plant in St. Louis

Work was recently started on the first section of the new plant for the manufacture of Hollowspun concrete lighting standards for St. Louis, by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., on a 10-acre plot on Bingham and Olivia Avenues, St. Louis. The new plant will be a one-story building of steel framework, erected in accordance with modern factory engineering practice. Additions to the building can be made without interfering with work in progress, so that the ultimate size and capacity of the plant may be far beyond that of the initial construction.

For production purposes, the factory will consist

King French Design Standard

King Standards in Waukesha, Wisconsin

THE illustration above portrays a night scene in Waukesha, Wisconsin, beautifully illuminated with King Standards of "French" design. This model is an embodiment of that grace and beauty typical of the French school of design, which, adapted to a sculptural column, has in the King Standard produced an architectural masterpiece that will enhance the streets and boulevards of any city.

Equally with architectural fitness the permanence of a street lighting installation should be considered. Good looks and long life are indispensable factors. The King-Graybar Electric organization is continually co-operating and planning with city officials that their skilled experience, guided advice and consultation may insure future satisfaction.

A Book of Street Lighting Facts—*Free*

Send today for this book "Ornamental Street Lighting." It is a complete outline of better street lighting facts with illustrations of King Standards and data relative to their installation. It will be sent free to those who desire to investigate this big subject of civic improvement.

KING COMPANY

The World's Foremost Manufacturer of Street Lighting Standards

230 South Clark Street, Chicago, Ill.

of two units, each unit having an initial capacity of 50 posts each 8-hour day. This capacity can be doubled with two shifts of workmen, so that the possible output of the new plant will be 200 posts per day from the start.

Factory production methods will be followed through the use of the production method, by which means the product will move in an unbroken assembly process from the time its components are mixed until it emerges at the other end of the plant a finished standard.

New Box Makes Meter Settings Better

A meter-box designed particularly for use in warm climates, and equipped with a hand wheel connection which expands to make a joint without the use of tools, has been developed by the Ford Meter Box Company, Wabash, Ind. With this box, no meter couplings, pipe fittings, valves, or valve-box, nor separate parts of any kind, are needed. The valve is included in the box, is rigidly supported and well-protected, yet easily accessible. This Type S box is easily installed. Once the box is in place, the meter may be set in an instant, removed again and reset, all without tools. On new services the box serves as a convenient spacer to pipe through, as proper alignment and spacing are secured and preserved automatically.

THE NEW FORD METER BOX CUT AWAY TO SHOW METER SETTING

The valve included in this meter-box is made of high-grade bronze and is held in place by the box, so that with only one pipe connection, which is outside the box, the valve is relieved of all piping strains and distorting forces.

The box is 12 inches deep, 12 inches long, and 8¼ inches wide, and is available for ⅝- and ¾ x ¾-inch meters.

A Six-Wheel, 3-000-Gallon Street Flusher

Close observation of the operation of motor flushers in various cities and a checking of the time consumed in the various operations of putting water into the flushers and its use on the street, has shown that one complete cycle takes about 25 minutes. Most of this time is lost, however, not in the water going into the flusher, but in finding a hydrant, getting a wrench, opening the hydrant, letting the water run until it is clear, closing the hydrant, getting the hose, connecting the hose, opening the hydrant, and filling. These details consume the lost 20 minutes for each tank of water, while the flusher will dispose of this water in about 5 minutes.

There has been a constant demand for flushers which would carry more water, from the days of the horse-drawn sprinkler which carried about 300 gallons of water, to the motor truck which started to carry about 600 or 700 gallons, and, finally, the 7-ton motor truck which carried about 1,600 gallons of water. The Fox Flusher, 2 Lombardy Street, Newark, N. J., is a 6-wheel truck driving and braking on the four rear wheels and carrying over 3,000 gallons of water, thus doubling the amount of flushing at practically the same cost and eliminating one-half of the lost time.

THE FOX 6-WHEEL FLUSHER

The distribution of this load through the pivoted springs has been analyzed and approved by the Pennsylvania Highway officials, who are most particular in the distribution of loads on motor-truck axles. One of the greatest advantages of the Fox flusher, carrying 3,000 gallons of water, is that the four rear or driving wheels which carry the major portion of the load are pivoted the same as is done on an 8-wheel trolley car; thereby a hole in the road gets only about 20 per cent of the jar which is given by four-wheel trucks. For illustration, in going over car tracks standing as high as 3 inches above the road, the Fox 6-wheel truck pivots over the tracks, and the jar to the truck or load is negligible. In turning into narrow streets, the last of the driving wheels track perfectly with the first driving wheels, thus allowing the flusher to turn corners which can hardly be turned with a touring car.

The engine operating this truck is a heavy-duty type 6-cylinder Buda which reduces vibration. The tank is perfectly balanced on the six wheels and is electric welded. The transmission and clutch are of the heaviest types and best makes. The rear end is made by Timken, and the job throughout is sturdy and of high-grade workmanship and material. One of these machines has been in operation for a year and as yet shows no signs of wear. The pump for flushing is operated by a power take-off and which forces the water to the Studebaker South Bend nozzles.

Essco Enlarges Factory

The Essco Manufacturing Company, Peoria, Ill., has announced that it has been necessary to enlarge its factory to the extent of 10,000 square feet, because of the steady, increasing business and development of Essco guaranteed traffic-control equipment.

McQueen Promoted

The B. F. Goodrich Rubber Company, Akron, Ohio, has announced the appointment of L. A. McQueen, its Advertising Manager, to be Assistant General Sales Manager in charge of Tire Division sales. He will continue to have general supervision of all advertising.

Continental Zone Painting Machine

Never Out of Order
Always Ready to go

All Aluminum
So Simple
One Man Operates

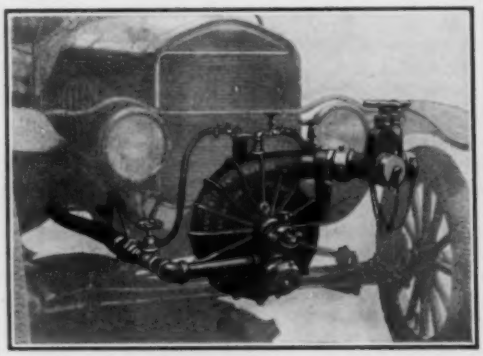
Patent Pending

No Spray Guns
No Gravity Feeds
No Pipe Lines
No Hose Connections
No Discs to Clog
No Brushes to Clean

MORE MARKING **LESS PAINT**

THE CONTINENTAL PRODUCTS CO.

Manufacturers of
Paint, Varnish and Roof Coating
Bliss Road, Euclid, Ohio



The BARTON Portable Fire Pump

This pump will furnish abundant capacity from any source of water supply. It is exceptionally useful as a "booster" for it increases the efficiency of the hydrant stream 100 per cent. In towns and villages having a limited water supply the Barton Portable Fire Pump is sure protection against fire loss.

Write for Bulletin

AMERICAN STEAM PUMP CO.
Battle Creek, Michigan

ALDRICH

THE ALDRICH PUMP COMPANY
No. 3 GORDON STREET
ALLENTOWN, PENNA.

REPRESENTATIVES WANTED

Single Suction
Double Suction
CENTRIFUGAL
Single Stage
Multi Stage

PUMPS

OHIO TRAFFIC GUIDE

PAT. JAN. 8, 1924
BASE BOLTED TO STREET SURFACE — NO EXCAVATION IN PAVEMENT
PROTECTION AND REFLECTION BARS
DUAL ILLUMINATION UNIT
HEAVY RAILROAD LENS
RAISED BLOCK TYPE LETTERS
KEEP TO RIGHT
ENAMELED STEEL REFLECTOR AND SOCKET HOLDER
HEAVY SEMI-STEEL CASTING — GENTLY SLOPING SIDES

Dia. 22 in., Weight 155 Pounds, Height 7 Inches, Pat. Jan. 8, 1924
Furnished With a Flasher at Small Extra Cost.
MANUFACTURERS ALSO OF
Street Name Signs, Parking, Warning, Direction Signs and Traffic Paint

OHIO TRAFFIC DEVICES CO.
806 North Fourth Street — Columbus, Ohio